I.B. 36-250-10

DESCRIPTION • INSTALLATION • MAINTENANCE • PARTS DATA

INSTRUCTIONS

LOAD INTERRUPTER SWITCH

TYPE V2-LB

7.2 through 161 Kv.

WESTINGHOUSE ELECTRIC CORPORATION

SWITCHGEAR APPARATUS DEPARTMENTS • EAST PITTSBURGH, PA.

SUPERSEDES I.B. 36-250-7

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DESCRIPTION

The type V2-LB interrupter is an addition to the Type V-2 switch line which enables the switch to open transformer magnetizing currents, line charging currents and load currents up to 600 amperes (at 50% power factor or better); and voltages of 7.2KV to 115KV ungrounded and 138KV to 161KV effectively grounded except the load current interrupting rating is 250 amperes at 161KV effectively grounded. The interrupting device is capable of 500 operations without maintenance. The interrupter is located in a current path which parallels the type V-2 switch. This secondary current path is a higher resistance path than the main switch, and it carries a negligible amount of current when the switch is closed. The switch blade is used to actuate the interrupter and to isolate it after interruption when the switch is opened. In a closing operation, the circuit is first established through the interrupter and the paralleling path prior to closing on the main switch contacts.

The interruption of current is accomplished by separable contacts enclosed in a gas filled porcelain housing. A piston and orifice assembly is attached to the moving contact rod which is driven by a modified toggle linkage mounted at the top of the porcelain. This toggle linkage is actuated by the main switch blade as previously mentioned. When the interrupter is tripped, the moving contact rod including the piston and orifice move so as to create a gas flow through the orifice where the arc is drawn. The sulphur hexafluoride (SF_6) gas has high dielectric strength and this characteristic together with the de-ionizing effect of flow through the orifice combine together to extinguish the arc drawn between the separated contacts.

The coordination of the switch and interrupter is such that as the V-2 switch blade breaks contact the current is diverted momentarily through the parallel interrupter circuit. As the V-2 switch blade opens, the blade tip engages the interrupter trip lever and actuates the interrupter contacts. The arc is drawn internally and extinguished with no visible display, thereby eliminating the damage of long arcs in air being blown together or into grounded structures creating system faults. Final opening motion of the switch blade picks up the paralleling auxiliary blade thus isolating the interrupter. In the open position the switch provides the full visible air gap required for the rated voltage.

INSTALLATION AND ADJUSTMENT

The adjustment of the V2-LB pole unit and operating mechanism should be made as described in Instruction Books I.B. 36-250-8 for switch ratings of 7.2 through 69KV or I.B. 36-250-9 for switch ratings of 69 (HD) through 161KV after the interrupter has been mounted and coordinated with the pole unit as described by the field erection drawing supplied with the switch. The longitudinal axis of the interrupter support casting should parallel the V-2 switch blade so that the trip stud on the main blade will engage the midpoints of the studs on the trip lever.

This is a feature related particularly to switches with stacked insulator columns. If the studs do not engage as outlined, it is a sign that the interrupter assembly or the break jaw insulator units need to be re-aligned by loosening the bolts, twisting the units and retightening the hardware. The engagement of the auxiliary blade with the Vee notched support on top of the interrupter assembly is also dependent upon the same alignment. The auxiliary blade should rest approximately in the center of the Vee notched support when the switch is closed and it may be necessary to re-align the support by loosening the hardware attaching it to the top of the interrupter, twisting the support and retightening the hardware.

On some switch ratings the auxiliary blades are biased with a spring tube assembly. It is important that this blade assembly pivots easily. If it is necessary in any case to remove this blade or it is apparent that friction is excessive, the assembly should be thoroughly lubricated at the hinge. This may be done by removing the cotter pin at the pivot casting. A graphite grease should be used to lubricate the bearing areas.

The adjustments for coordination of the interrupter trip lever and the switch blade are detailed on the field assembly drawings which accompany the equipment. There should be at least one inch engagement between the stud on the switch and the trip lever studs at the time the blade "picks up" the trip lever. As noted on the field assembly drawing the position of the trip lever gives an indication of whether the interrupter is open or closed. If the lever is horizontal, the interrupter is open and if it is down, the interrupter is closed. As an additional check on operation a sharp metallic sound is audible when the contacts make or break.

The angular position of the interrupter trip lever is set at the factory and should only require minor adjustment for mechanical coordination with the main switch. To make minor adjustments of the trip lever position loosen the hardware which secures the trip lever to the shaft and the hardware which secures the two serrated castings together. Disengage the serration contact between the castings, move the trip lever studs to the desired location and retighten the hardware. The trip stud on the switch blade must mechanically clear the lower trip lever stud when the trip lever is in the extreme closed position and the upper trip lever stud when the trip lever is in the extreme open position. Slight adjustment in the length of the stud on the switch blade may also be made.

The functioning of the interrupter may be checked positively by "lighting out" with a flashlight or "ringing out" by a bell circuit instead of depending on audible sounds and trip lever position. If such a check is made, the auxiliary blade or paralleled current path must be lifted from the interrupter when the main switch is closed, otherwise the test circuit is shorted.

When the interrupters have been completely adjusted, the switch blade and break jaw should be aligned. With the break jaw mounting bolts loosened, the switch blade should be closed into the jaw and rotated several times in order to allow the jaw to align itself with the blade contact tip. With the blade still closed tighten the bolts which mount the break jaw.

MAINTENANCE

The interrupters are vacuum and pressure tested at the factory and filled to pounds per square inch gauge pressure with sulphur hexafluoride. Due to molecular diffusion of gas through materials, recharging may be necessary. A filling valve is provided at the base of each interrupter to facilitate recharging with gas. Periodic pressure checks every 3 or 4 months are recommended as an operating safeguard. After the units have been in service some time, this period may be increased if experience so indicates.

Each interrupter is equipped with a pressure gauge so arranged that it is readable from the ground level. Although the interrupters are filled to 30 PSIG at a temperature of 80 degrees F. at the factory, the pressure readings in service will vary with the ambient temperature. Figure 1 shows the pressure-temperature relationship and should be used as a guide in recharging the units with gas.

The interrupters will function properly with the pressure as low as shown on the minimum pressure-temperature curve on Figure 1. If the pressure drops below this minimum pressure, but not to zero, the units may be fully recharged with gas by attaching a bottle of sulphur hexafluoride with pressure regulator and hose to the filling valve at the bottom of the interrupter. The valves on the bottle and regulator should be "cracked" slightly in order to purge the connecting hose immediately before attaching the hose to the filling valve. After attaching the hose to the filling valve, fully open the bottle and regulator valves and set the regulator at the pressure corresponding to the temperature on the fully charged curve on Figure 1. Then open the filling valve until the interrupter is fully recharged with gas. The filling valve should then be closed using a torque wrench set at 4 to 5 foot-pounds torque to provide a positive seal and to prevent damage to the valve seat.

Figure 2 gives a view of the recharging equipment setup and Table I gives a description of the equipment recommended to perform the gas recharging operation. The actual weight of gas required to completely charge each interrupter from 30" of vacuum to 30 PSIG is tabulated in Table II.

In the event that maintenance or repair is required on an interrupter which cannot be handled in the customer's own shop, the local Engineering and Service Office should be contacted for disposition.

In the event that an interrupter should be dismantled in the field, the filling valve should be opened when the interrupter is outdoors or under a ventilating hood indoors. Sulphur hexafluoride is an extremely stable and harmless gas in the pure state. After it has been subjected to arcing, there is a slight amount of decomposition with some of the products of decomposition being irritating to the nasal passages if inhaled. For this reason, it is recommended that personnel avoid breathing the arced gas and the interrupter be emptied as suggested above.

The deterioration of sulphur hexafluoride upon repeated arc interruptions is negligible and it is not necessary to recharge a unit after a series of operations. The gas itself has an indefinite life independent of the number of arc interruptions to which it is exposed.

TABLE I

Equipment Recommended for Recharging Type V2-LB Interrupters with Gas

Quantity	Description
1	Bottle of sulphur hexafluoride (SF_6) gas. Available from the Matheson Co., Inc. Joliet, Illinois or East Rutherford New Jersey in 25, 50 and 100 pound (gas weight) bottles.
1	Single stage automatic regulator Matheson Cat. No. 1 with inlet No. 590
1	Suitable length of 1/4 inch inside diameter flexible filling hose. Welding hose may be used.
1	Male connector for filling valve end of hose, 1/4 inch I.D. hose to 1/4 inch IPS pipe elbow, 18 threads per inch, standard taper.

Quantity	Description
1	Female connector for regulator end of hose, 1/4 inch I.D. hose to 1/4 inch IPS male outlet on regulator valve, 18 threads per inch, standard taper.
1	Torque wrench with socket to fit 3/8 inch square stem on filling valve and adjustment for 4 to 5 foot-pounds torque.

TABLE II

Tabulation of Gas Weight Required to Fully Charge Interrupters

Interrupting Rating KV	Sulphur Hexafluoride Pounds (Weight) Approx.
15	0.57
23	0.71
34.5	0.71
46	0.80
69	0.82
115	1.20
138	1.25

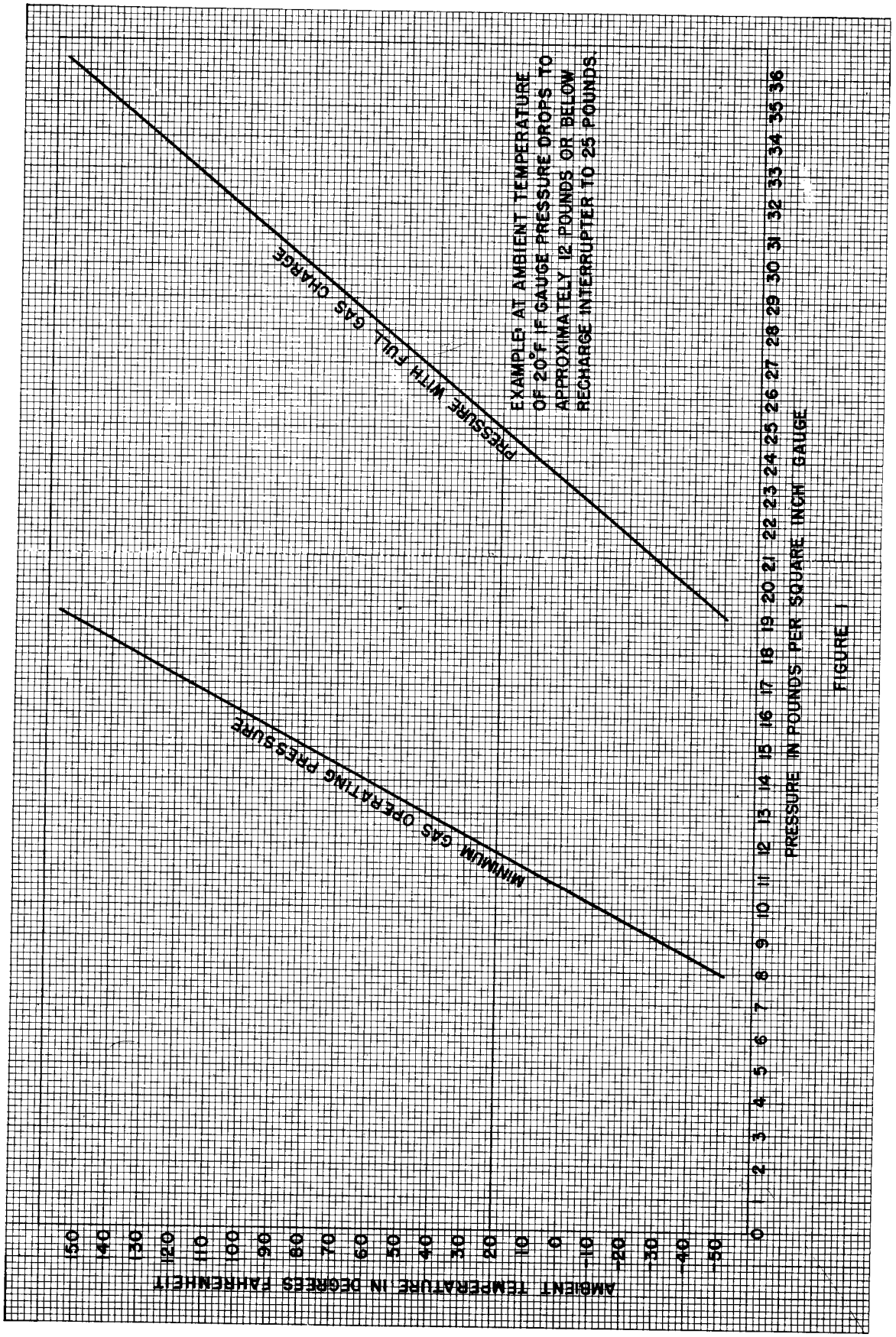
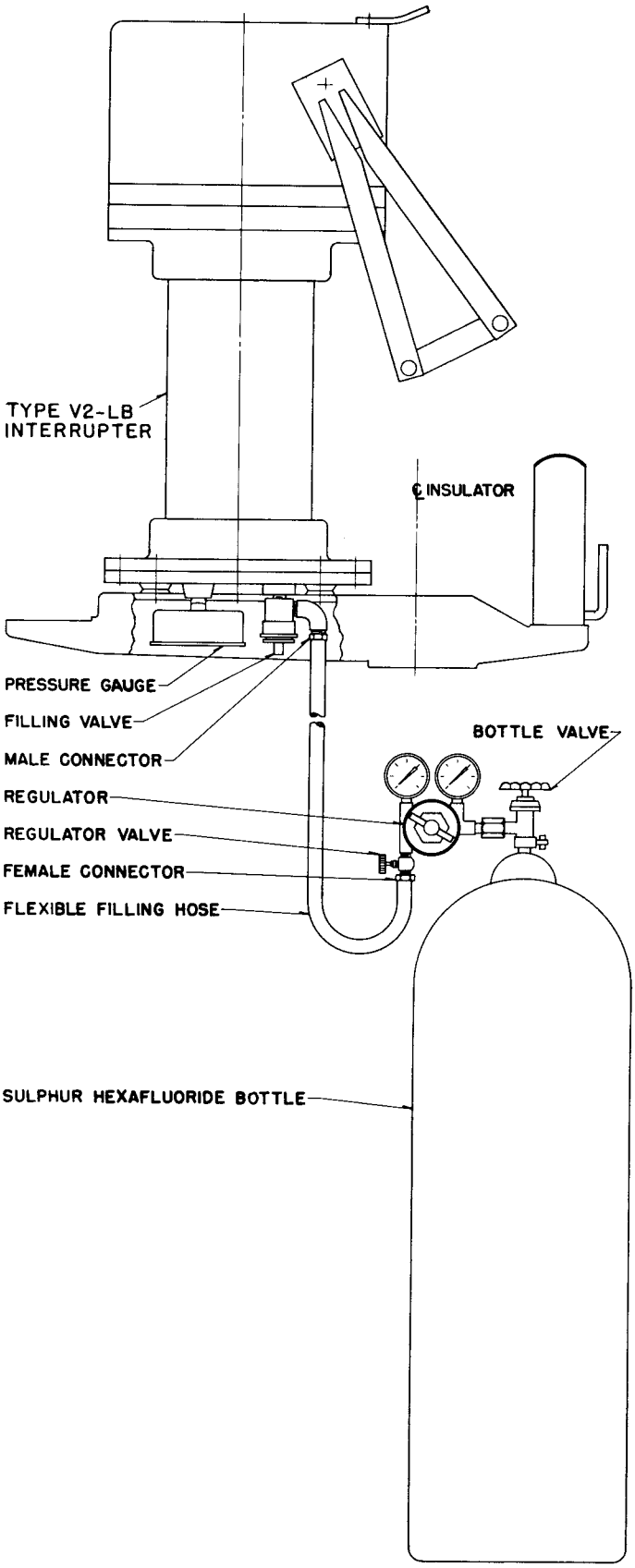

AMBIENT TEMPERATURE IN DEGREES FAHRENHEIT
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50
PRESSURE IN POUNDS PER SQUARE INCH GAUGE
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
MINIMUM GAS OPERATING PRESSURE
PRESSURE WITH FULL GAS CHARGE
EXAMPLE: AT AMBIENT TEMPERATURE OF 20°F IF GAUGE PRESSURE DROPS TO APPROXIMATELY 12 POUNDS OR BELOW RECHARGE INTERRUPTER TO 25 POUNDS.

FIGURE 1



VIEW OF RECOMMENDED GAS RECHARGING SETUP

FIGURE NO. 2

PARTS IDENTIFICATION

The following is a list of the parts on this switch that are most subject to wear in ordinary operation and to damage or breakage due to abnormal conditions. Parts recommended to be kept in stock are listed on the basis of the number of units in service. When ordering any parts, always specify the part name, the figure and item numbers and the number of this instruction book. Also always supply full information from the nameplate of the switch.

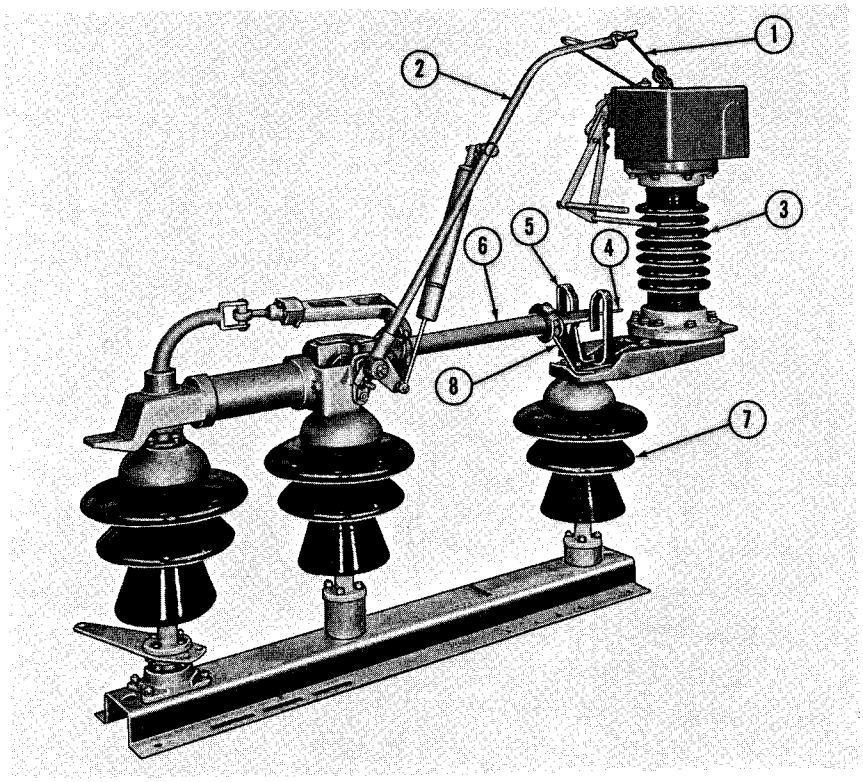


FIGURE 3

PARTS IDENTIFICATION

NAME OF PART	ILLUSTRATION Figure No.	ILLUSTRATION Item No.	NUMBER REQUIRED FOR ONE SWITCH	NUMBER OF SWITCHES IN USE Recommended for Stock 1-5	6-10	11-UP
Auxiliary Blade Support	3	1	3	3	6	9
Auxiliary Blade	3	2	3	3	6	9
Interrupter	3	3	3	1	2	3
Trip Stud	3	4	3	3	6	9
Break Jaw	3	5	3	1	3	6
Main Blade	3	6	3	1	3	6
Insulator	3	7	9	3	6	9
Lift Rod	3	8	3	3	6	9