INSTRUCTIONS

PARALLEL OPERATION
WITH STEP-BY-STEP SWITCHES
For Two TCUL* Transformers in Double-Ended Substations

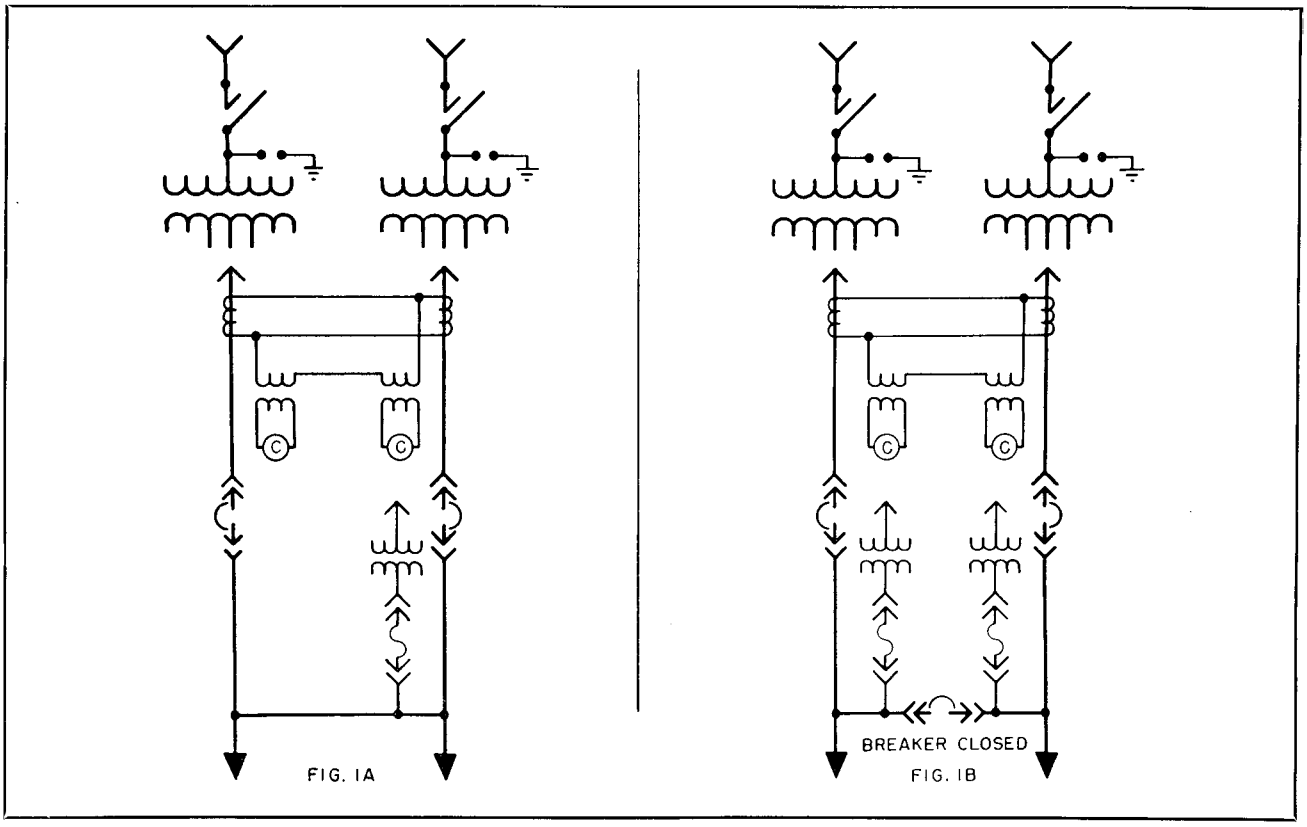


FIG. 1. Single Line Diagram of Operating Conditions.

IN THE PARALLEL OPERATION of double-ended unit substations using step-by-step switches, one unit is selected as the master unit and is operated by the usual primary and time delay relays. The other unit then follows the operation of and is controlled by the master unit.

Fig. 1 shows the two system connections for operation of double-ended unit substations.

Fig. 1-A shows two transformers in parallel feeding a common low voltage bus which is regulated by both transformers. Both compensators must have the same setting.

Fig. 1-B shows the two transformers normally operating in parallel with the low voltage tie breaker closed so that both transformers are feeding a common low voltage bus which is regulated by both transformers. Note that the conditions are the same as shown in Fig. 1-A, except a low voltage tie breaker has been added, and operated normally closed.

LINE DROP COMPENSATION

Referring to Fig. 1-A, correct compensation will be maintained in the event that one transformer is disconnected. For example, assume both transformers to be of equal Kva, and each transformer carrying one-half load so that each main current transformer will have 2½ amperes in its secondary. The main current transformers are connected in parallel and the compensator coupling current transformers are connected in series, so that the current in each compensator transformer is 5 amperes. When one unit is relayed out of service, the remaining unit will carry the total load which

*Tap-Changing-Under-Load

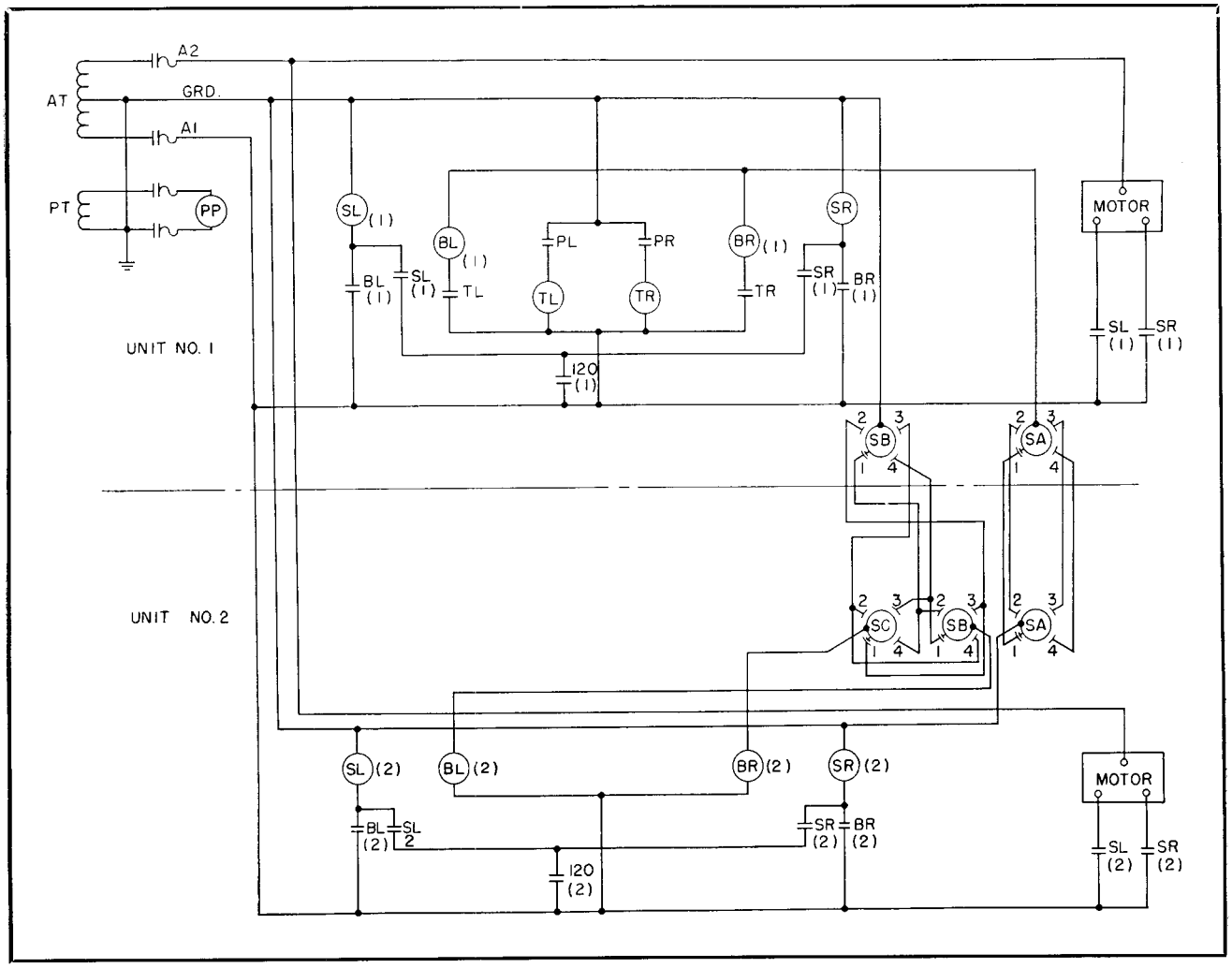


FIG. 2. Fundamental Diagram of Operation.

will be 100 percent of its rating. Five amperes will flow in the coupling current transformer, hence the compensation will still be correct.

Since it is possible to get 10 amperes in the primary of the compensator coupling current transformers when both transformers are carrying full load, this transformer is rated 10 to 5 amperes so that 5 amperes is the maximum current which can reach the compensator under any normal conditions.

CONTROL OPERATION

Fig. 2 shows the fundamental operation of control. This diagram shows the basic requirements for paralleling two transformers in which either unit may be master. This basic system is later applied to a standard control as shown in Fig. 3.

In Fig. 2, the voltage regulating relay "P" of Unit 1 has contacts "PR" and "PL" which close to initiate operation in the raise or lower directions respectively. Briefly, the sequence of operation is as follows: assuming a raise operation is required, then Unit 1 moves to make a tap change. As Unit 1 completes its tap change, Unit 2 starts to move. Unit 1 completes its tap change and stops. Unit 2 completes its tap change and stops. The control is then set up so that Unit 1 can again make a tap change and the sequence occurs in the same order.

Assuming a raise operation is required, the contact "PR" closes, completing the circuit to timing relay "TR" which completes its time delay cycle and closes its contact "TR".

The step-by-step switches are shown at SA, SB, and SC. These switches are mechanically operated from the tap changer mechanism so that as the tap changer moves from one position to another the step-by-step switches also move from one contact to the next. The contact sequence is 1-2-3-4-1, etc., for tap changer operation in the raise direction, and 3-2-1-4-3, etc., for tap changer operation

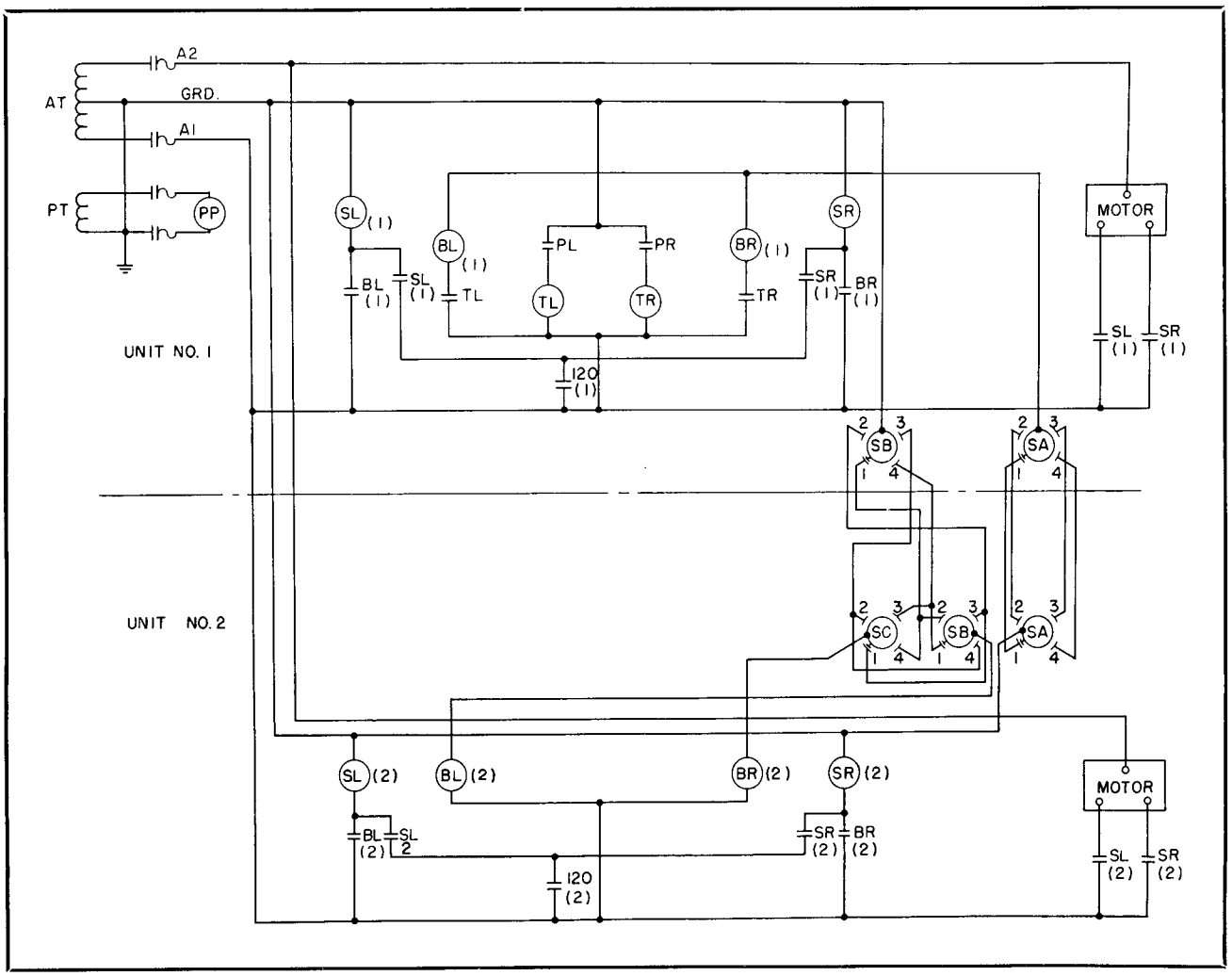


FIG. 2. Fundamental Diagram of Operation.

will be 100 percent of its rating. Five amperes will flow in the coupling current transformer, hence the compensation will still be correct.

Since it is possible to get 10 amperes in the primary of the compensator coupling current transformers when both transformers are carrying full load, this transformer is rated 10 to 5 amperes so that 5 amperes is the maximum current which can reach the compensator under any normal conditions.

CONTROL OPERATION

Fig. 2 shows the fundamental operation of control. This diagram shows the basic requirements for paralleling two transformers in which either unit may be master. This basic system is later applied to a standard control as shown in Fig. 3.

In Fig. 2, the voltage regulating relay "P" of Unit 1 has contacts "PR" and "PL" which close to initiate operation in the raise or lower directions respectively. Briefly, the sequence of operation is as follows: assuming a raise operation is required, then Unit 1 moves to make a tap change. As Unit 1 completes its tap change, Unit 2 starts to move. Unit 1 completes its tap change and stops. Unit 2 completes its tap change and stops. The control is then set up so that Unit 1 can again make a tap change and the sequence occurs in the same order.

Assuming a raise operation is required, the contact "PR" closes, completing the circuit to timing relay "TR" which completes its time delay cycle and closes its contact "TR".

The step-by-step switches are shown at SA, SB, and SC. These switches are mechanically operated from the tap changer mechanism so that as the tap changer moves from one position to another the step-by-step switches also move from one contact to the next. The contact sequence is 1-2-3-4-1, etc., for tap changer operation in the raise direction, and 3-2-1-4-3, etc., for tap changer operation

INSTRUCTIONS

PARALLEL OPERATION
WITH STEP-BY-STEP SWITCHES
For Two TCUL* Transformers in Double-Ended Substations

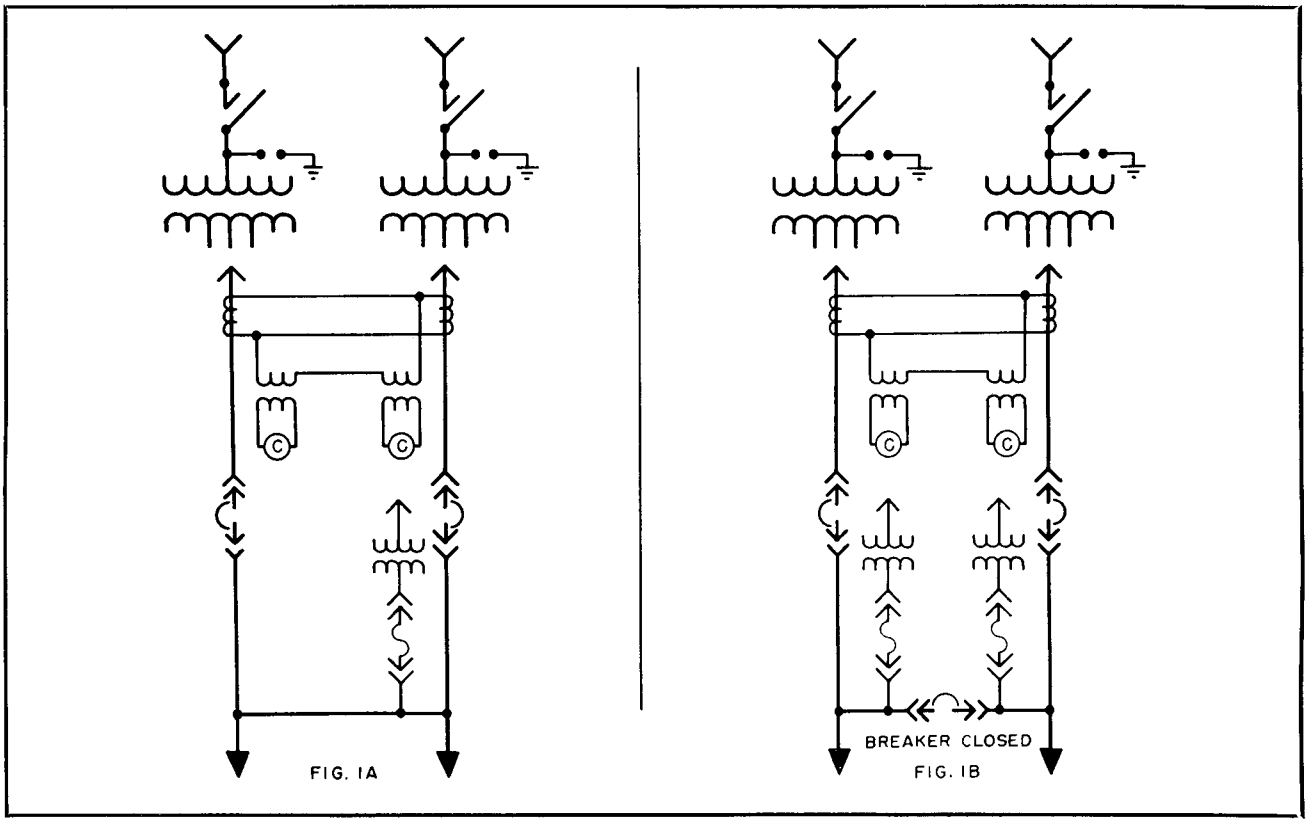


FIG. 1. Single Line Diagram of Operating Conditions.

IN THE PARALLEL OPERATION of double-ended unit substations using step-by-step switches, one unit is selected as the master unit and is operated by the usual primary and time delay relays. The other unit then follows the operation of and is controlled by the master unit.

Fig. 1 shows the two system connections for operation of double-ended unit substations.

Fig. 1-A shows two transformers in parallel feeding a common low voltage bus which is regulated by both transformers. Both compensators must have the same setting.

Fig. 1-B shows the two transformers normally operating in parallel with the low voltage tie breaker closed so that both transformers are feeding a common low voltage bus which is regulated by both transformers. Note that the conditions are the same as shown in Fig. 1-A, except a low voltage tie breaker has been added, and operated normally closed.

LINE DROP COMPENSATION

Referring to Fig. 1-A, correct compensation will be maintained in the event that one transformer is disconnected. For example, assume both transformers to be of equal Kva, and each transformer carrying one-half load so that each main current transformer will have 2½ amperes in its secondary. The main current transformers are connected in parallel and the compensator coupling current transformers are connected in series, so that the current in each compensator transformer is 5 amperes. When one unit is relayed out of service, the remaining unit will carry the total load which

*Tap-Changing-Under-Load

in the lower direction. The switches are aligned with the tap changer mechanism during manufacture so that step-by-step contact No. 1 is closed when the tap changer is on position 1. Thus, for any given position of the tap changer, a definite contact of the step-by-step switches will be closed and it will be the same contact on all tap changers.

If both tap changers, Unit 1 and Unit 2, are on the same position, which is illustrated in Fig. 1, the step-by-step switches of both units will be closed on contact 1, and the closing of time delay relay contacts TR completes the circuit from bus A1 through relay coil BR (1), and through the step-by-step switches SA of both units to ground bus GRD. Therefore, relay BR (1) is energized and closes its contacts BR (1) which operate motor control relay SR (1). Contacts SR (1) energize the tap changer motor to operate the tap changer of Unit 1 in the raise direction.

Immediately after the tap changer begins to operate, the cam-operated contacts 120 (1) are closed completing the circuit through the sealing contacts of SR (1) so that the tap change will be completed even though the BR relay is de-energized.

Soon after the tap changer operation closes contacts 120 (1), the continued operation of the tap changer opens the step-by-step switch SA-1. This opens the circuit to BR (1) so that it is de-energized and its contacts BR (1) open.

As the tap changer approaches the next position, contact SA-2 closes, but this does not complete the circuit to BR (1) since the SA switch of Unit 2 is still on contact 1. As the next position is reached, cam-operated contacts 120 are opened, de-energizing relay SR (1) so that the tap changer of Unit 1 stops on position.

During the operation of Unit 1 tap changer, the step-by-step switch SB was mechanically operated in synchronism with SA; therefore, SB-2 contacts are now closed. These contacts established a circuit from bus GRD through SB-2 of Unit 1 and SC-1 of Unit 2 relay BR (2), which is connected to bus A1. Therefore, relay BR (2) operates and closes its contacts BR (2) which operate relay SR (2). The contacts of relay SR (2) energize the tap changer motor of Unit 2 to operate it in the raise direction.

As soon as the tap changer starts to operate, cam-operated contact 120 (2) closes the sealing circuit to relay SR (2), so that the tap changer will continue to operate even though BR is de-energized.

As the operation continues, step-by-step switch SC of Unit 2 is mechanically operated by the tap changer so that its contact 1 is open and relay BR (2) is de-energized.

As the next position is approached, switches SA, SB and SC being driven in synchronism connect to contact 2 and as the next position is reached the cam operated switch 120 (2) opens and de-energizes relay SR (2) so that the tap changer stops on position.

The circuit through SB of Unit 1 and SB and SC of Unit 2 is now opened so Unit 2 will make no further operations. Also, the circuit through SA of Units 1 and 2 is closed so that Unit 1 can operate again if the voltage regulating relay requires further operation.

If the voltage regulating relay had been assumed to close contacts PL instead of PR, the operation of the two units would have been the same as described except that relays TL and BL and step-by-step switch SB would have controlled the operation.

APPLICATION TO STANDARD UNIT SUBSTATION CONTROL

The circuit and equipment as described above is applied to the standard unit substation tap changer control as shown in I.L. 48-900-14.

In Fig. 3, the step-by-step switch circuit as described above is applied to the control circuits of I.L. 48-900-14, using the nomenclature and symbols of the Instruction Leaflet and Fig. 2.

In Fig. 3, duplicate equipment is shown on each unit so that either may be slected as the master unit and the other as the follower unit. The switch PS is the paralleling selector switch and is shown in Fig. 3 with Unit 1 as the "Master" and Unit 2 as the "Follower". The "Sequence of Operation" chart in Fig. 3 shows the contact arrangement for each of the three positions, namely: Independent, Parallel Follower, and Parallel Master. The purpose of the contacts PS1 to PS21 is as follows:

a. PS1 to 8 connects the step-by-step switches SB and SC so that proper step-by-step operation is obtained, switches 2, 4, 6 and 8 are closed on the master unit, and switches 1, 3, 5 and 7 are closed on the follower unit.

4. Both units are controlled from one voltage regulating relay and line drop compensator so that differences in relay adjustments do not effect the parallel operation.

5. Tap changers will operate in parallel at all times irrespective of which unit is master or which circuit breaker is closed.

6. Opening both circuit breakers locks out both tap changers to prevent either tap changer from operating idly when the entire stations is shut down.

7. A relay connected across the reclosing relay motor prevents either tap changer from operating while the reclosing relay of any feeder breaker is operating.

8. When network or reverse power relays are used, one unit may be tripped off the line, but both tap changers will remain in step and continue to operate. When the de-energized transformer is put back on the line, both tap changers will be in step.

9. Bus regulation and compensation is correct, regardless of whether one or both transformer units are operating.

10. Either unit may be master with no change in operation being required. It is only necessary to set the parallel independent switch of each unit to make one unit the "Master" and the other unit the "Follower".

11. Operation is entirely automatic when units are set for parallel operation. It is not necessary to go to the substation to change over controls due to switching operations. If units are to be separated for independent operation, the changeover is manual and is as follows:

a. Change current transformer connections by means of terminal block jumpers.

b. Change the circuit breaker relay connections so that the tie breaker will remain open.

c. Set the parallel-independent switch on both units on "Independent".

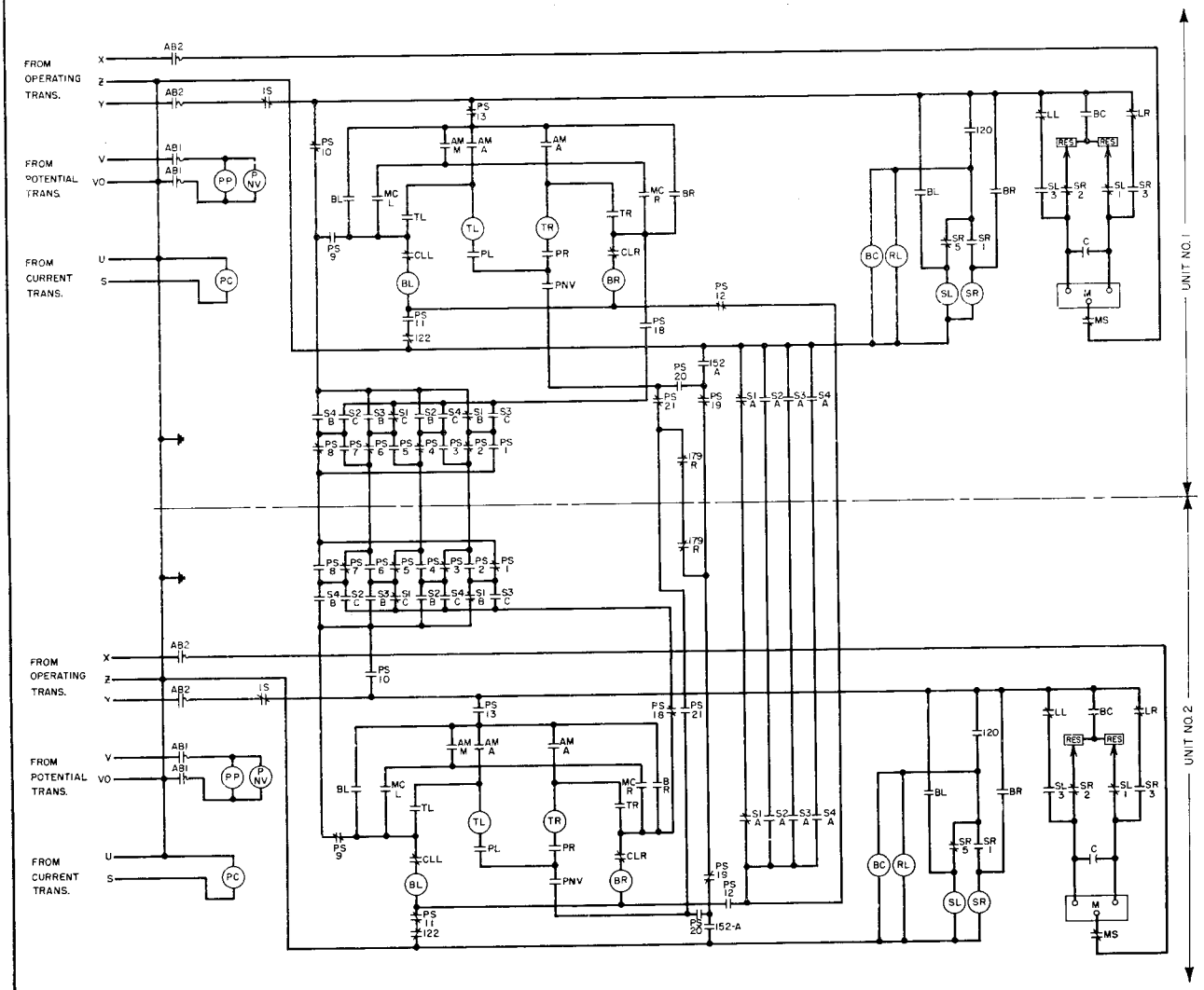
d. Reset the compensators of both units to the required setting for each feeder.

REPAIR PARTS

Order renewal parts from the nearest Westinghouse office, giving serial number, type, and S.O. or style number stamped on the main transformer nameplate and also a complete description of the parts required.

WESTINGHOUSE ELECTRIC CORPORATION
SHARON PLANT • TRANSFORMER DIVISION • SHARON, PA.

Printed in U.S.A.



LEGEND

VOLTAGE REGULATING RELAY
PP-POTENTIAL COIL
PC-LINE DROP COMPENSATOR
PNV-NO VOLTAGE DEVICE
TR, TL-TIME DELAY RELAYS
AM-AUTOMATIC MANUAL SELECTOR SWITCH
MC-MANUAL CONTROL SWITCH
PS-PARALLELING SWITCH
SA-, SB-, SC-, -STEP BY STEP SWITCH
BR, BL-AUXILIARY RELAYS
RL-OFF POSITION INDICATING LIGHT
M, C-MOTOR AND CAPACITOR
BC-"DYNAC" BRAKE
120-122-IS-PILOT SWITCHES
LL, LR, 124, 125-LIMIT SWITCHES
MS, -MECHANICAL STOP SWITCH
SR, SL-MOTOR CONTROL RELAYS

PS SWITCH

CONTACT	POSITION		
	IND	PAR FOLLOWER	PAR MASTER
PS1		X	
PS2			X
PS3		X	
PS4			X
PS5		X	
PS6			X
PS7		X	
PS8			X
PS9		X	
PS10			X
PS11	X	X	
PS12			X
PS13	X		X
PS18		X	
PS19		X	X
PS20	X		
PS21			X

X=CONTACTS CLOSED

FIG. 3. Schematic Diagram of Control Connections.

b. PS9 connects switch SB to the control relays on the follower unit to permit operation by the step-by-step switches.

c. PS10 connects the ground side of the power source to switch SB of the master unit to provide operating voltage for the control relays of the follower unit.

d. PS11 provides the grounded side of the power source for the control relays when both units are operating independently.

e. PS12 connects the ground side of the power source to the control relays of the master unit through the SA switches.

f. PS13 connects the automatic and manual initiating circuits to the power source to provide operating voltage for the master unit or for independent operation.

g. PS18 connects switch SC to the control relays on the follower unit to permit operation by the step-by-step switches.

h. PS19 and PS21 connect the initiating circuits of the master unit to ground through the 152A contacts of the circuit breakers and the 179R contacts of the reclosing relays.

i. PS20 connects the initiating circuits to ground for independent operation.

The operation of Fig. 3 is exactly as described for Fig. 2 plus the additional description of the paralleling switch above, the description outlined in I.L. 48-900-14, and the following description covering the operation of contacts 152A and 179R.

The purpose of the 152A and 179R contacts is as follows: The 152A contacts, which are auxiliary contacts ot the circuit breaker and operate the same as the circuit breaker, are paralleled and are in series with the PL and PR contacts. This arrangement allows both tap changers to operate provided one of the circuit breakers is closed. This means if one unit were de-energized, the tap changers would continue to regulate the output voltage. However, if both circuit breakers are open, both tap changers are locked out.

The 179R contacts are contacts of a relay which is paralleled with the motor of the reclosing relay. These contacts are normally closed and stay open only as long as the reclosing relay motor is running. Since they are in series with the PL and PR contacts, if either one opens, both tap changers are locked out. This prevents a tap change from occurring during the reclosing cycle of either circuit breaker.

PROCEDURE FOR PARALLEL OPERATION

To set up both units for operating in parallel the following procedure is recommended:

1. Place both tap changers on the same tap position by means of the manual control switch. Then close the disconnect switches or breakers paralleling the transformer.

2. Determine which unit is to be master and set its parallel switch to "Par.-Master" position.

3. Set the follower unit parallel switch to "Par.-Follower" position

4. Adjust the line drop compensator of the master unit to the load requirements.

5. Set the Auto-Man switch of the master unit for automatic or manual control as desired.

If it is desired to return both units to independent operation, place the parallel switch of both units on the IND position and adjust each compensator for its individual load.

POTENTIAL AND AUXILIARY TRANSFORMER LOCATION

To obtain proper operation of these systems, it is necessary to take the potential and auxiliary power supplies for the tap changers from the bus side of the transformer breakers. Both tap changers keep in step even though the one transformer circuit breaker is open and one unit is out of service. Regulation is maintained even though the master unit is tripped off due to relaying as voltage supply to the bus is maintained through the follower unit. This allows closing in the de-energized unit without the necessity of first lining up the tap changers.

ADVANTAGES

The advantages of the step-by-step method of paralleling may be summarized as follows:

1. Positive lockout is provided so that the parallel tap changer cannot become more than one step apart.

2. Each tap changer operates from one position to the next, under the control of its own 120 pilot switch and its own motor control relays. Therefore, differences in tap changer speeds do not interfere with proper parallel operation.

3. The follower unit operates immediately after the master unit with no intermediate time delay relaying.

e. PS12 connects the ground side of the power source to the control relays of the master unit through the SA switches.

f. PS13 connects the automatic and manual initiating circuits to the power source to provide operating voltage for the master unit or for independent operation.

g. PS18 connects switch SC to the control relays on the follower unit to permit operation by the step-by-step switches.

h. PS19 and PS21 connect the initiating circuits of the master unit to ground through the 152A contacts of the circuit breakers and the 179R contacts of the reclosing relays.

i. PS20 connects the initiating circuits to ground for independent operation.

The operation of Fig. 3 is exactly as described for Fig. 2 plus the additional description of the paralleling switch above, the description outlined in I.L. 48-900-12, and the following description covering the operation of contacts 152A and 179R.

The purpose of the 152A and 179R contacts is as follows: The 152A contacts, which are auxiliary contacts of the circuit breaker and operate the same as the circuit breaker, are paralleled and are in series with the PL and PR contacts. This arrangement allows both tap changers to operate provided one of the circuit breakers is closed. This means if one unit were de-energized, the tap changers would continue to regulate the output voltage. However, if both circuit breakers are open, both tap changers are locked out.

The 179R contacts are contacts of a relay which is paralleled with the motor of the reclosing relay. These contacts are normally closed and stay open only as long as the reclosing relay motor is running. Since they are in series with the PL and PR contacts, if either one opens, both tap changers are locked out. This prevents a tap change from occurring during the reclosing cycle of either circuit breaker.

POTENTIAL AND AUXILIARY TRANSFORMER LOCATION

To obtain proper operation of these systems, it is necessary to take the potential and auxiliary power supplies for the tap changers from the bus side of the transformer breakers. Both tap changers keep in step even though the one transformer circuit breaker is open and one unit is out of service. Regulation is maintained even though the master unit is tripped off due to relaying as voltage supply to the bus is maintained through the follower unit. This allows closing in the de-energized unit without the necessity of first lining up the tap changers.

ADVANTAGES

The advantages of the step-by-step method of paralleling may be summarized as follows:

1. Positive lockout is provided so that the parallel tap changer cannot become more than one step apart.

2. Each tap changer operates from one position to the next, under the control of its own 120 pilot switch and its own motor control relays. Therefore, differences in tap changer speeds do not interfere with proper parallel operation.

3. The follower unit operates immediately after the master unit with no intermediate time delay relaying.

4. Both units are controlled from one voltage regulating relay and line drop compensator so that differences in relay adjustments do not effect the parallel operation.

5. Tap changers will operate in parallel at all times irrespective of which unit is master or which circuit breaker is closed.

6. Opening both circuit breakers locks out both tap changers to prevent either tap changer from operating idly when the entire stations is shut down.

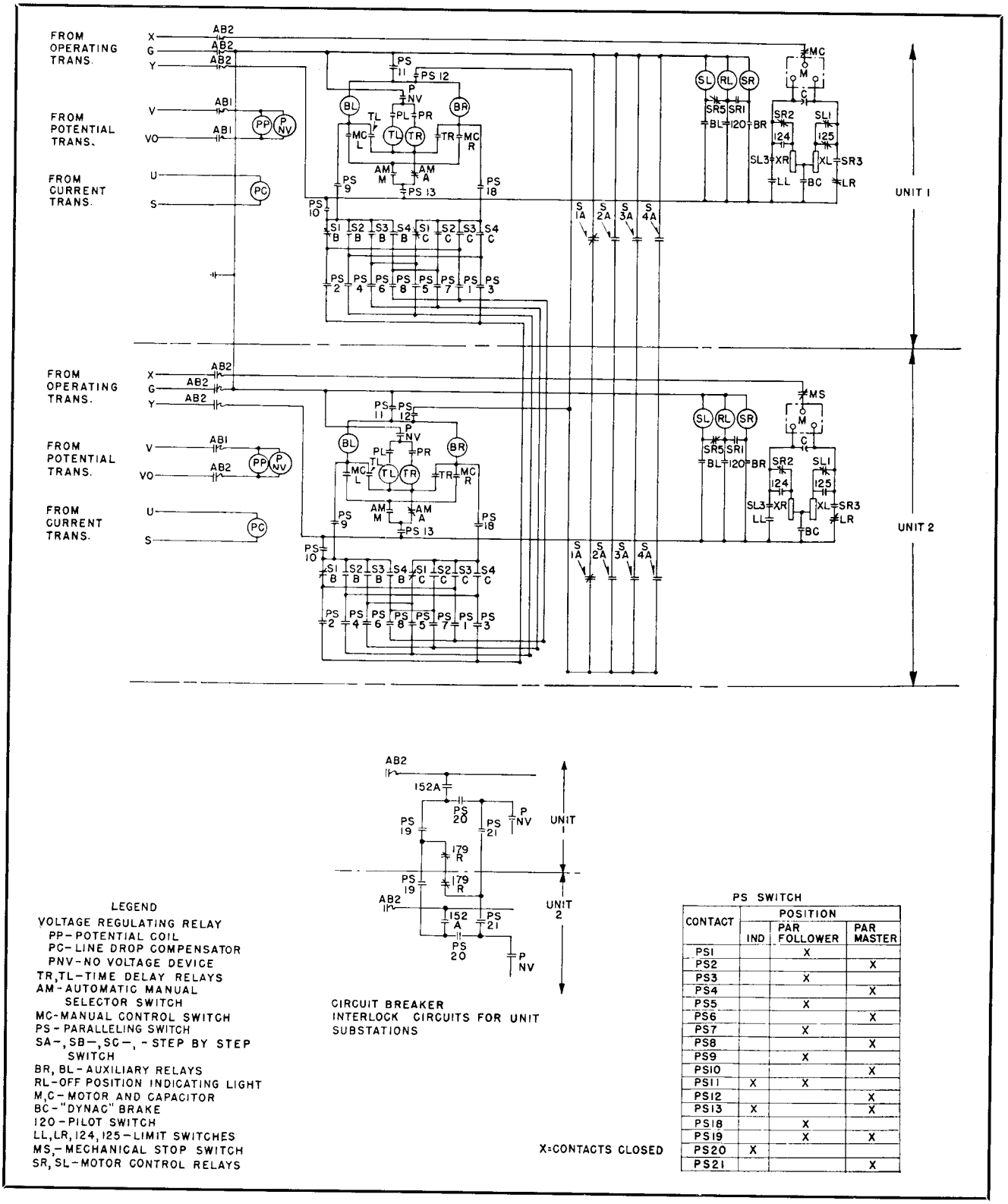
7. A relay connected across the reclosing relay motor prevents either tap changer from operating while the reclosing relay of any feeder breaker is operating.

8. When network or reverse power relays are used, one unit may be tripped off the line, but both tap changers will remain in step and continue to operate. When the de-energized transformer is put back on the line, both tap changers will be in step.

9. Bus regulation and compensation is correct, regardless of whether one or both transformer units are operating.

10. Either unit may be master with no change in operation being required. It is only necessary to set the parallel independent switch of each unit to make one unit the "Master" and the other unit the "Follower".

11. Operation is entirely automatic when units are set for parallel operation. It is not necessary to go to the substation to change over controls due



LEGEND

VOLTAGE REGULATING RELAY
PP-POTENTIAL COIL
PC-LINE DROP COMPENSATOR
PNV-NO VOLTAGE DEVICE
TR,TL-TIME DELAY RELAYS
AM-AUTOMATIC MANUAL SELECTOR SWITCH
MC-MANUAL CONTROL SWITCH
PS-PARALLELING SWITCH
SA-,SB-,SC-,-STEP BY STEP SWITCH
BR, BL-AUXILIARY RELAYS
RL-OFF POSITION INDICATING LIGHT
M,C-MOTOR AND CAPACITOR
BC-"DYNAC" BRAKE
120-PILOT SWITCH
LL,LR,124,125-LIMIT SWITCHES
MS,-MECHANICAL STOP SWITCH
SR,SL-MOTOR CONTROL RELAYS

PS SWITCH

CONTACT	POSITION		
	IND	PAR FOLLOWER	PAR MASTER
PS1		X	
PS2			X
PS3		X	
PS4			X
PS5		X	
PS6			X
PS7		X	
PS8			X
PS9		X	
PS10			X
PS11	X	X	
PS12			X
PS13	X		X
PS18		X	
PS19		X	X
PS20	X		
PS21			X

X=CONTACTS CLOSED

FIG. 3. Schematic Diagram of Control Connections.

c. PS10 connects the ground side of the power source to switch SB of the master unit to provide operating voltage for the control relays of the follower unit.

d. PS11 provides the grounded side of the power source for the control relays when both units are operating independently.

in the lower direction. The switches are aligned with the tap changer mechanism during manufacture so that step-by-step contact No. 1 is closed when the tap changer is on position 1. Thus, for any given position of the tap changer, a definite contact of the step-by-step switches will be closed and it will be the same contact on all tap changers.

If both tap changers, Unit 1 and Unit 2, are on the same position, which is illustrated in Fig. 1, the step-by-step switches of both units will be closed on contact 1, and the closing of time delay relay contacts TR completes the circuit from bus A1 through relay coil BR (1), and through the step-by-step switches SA of both units to ground bus GRD. Therefore, relay BR (1) is energized and closes its contacts BR (1) which operate motor control relay SR (1). Contacts SR (1) energize the tap changer motor to operate the tap changer of Unit 1 in the raise direction.

Immediately after the tap changer begins to operate, the cam-operated contacts 120 (1) are closed completing the circuit through the sealing contacts of SR (1) so that the tap change will be completed even though the BR relay is de-energized.

Soon after the tap changer operation closes contacts 120 (1), the continued operation of the tap changer opens the step-by-step switch SA-1. This opens the circuit to BR (1) so that it is de-energized and its contacts BR (1) open.

As the tap changer approaches the next position, contact SA-2 closes, but this does not complete the circuit to BR (1) since the SA switch of Unit 2 is still on contact 1. As the next position is reached, cam-operated contacts 120 are opened, de-energizing relay SR (1) so that the tap changer of Unit 1 stops on position.

During the operation of Unit 1 tap changer, the step-by-step switch SB was mechanically operated in synchronism with SA; therefore, SB-2 contacts are now closed. These contacts established a circuit from bus GRD through SB-2 of Unit 1 and SC-1 of Unit 2 relay BR (2), which is connected to bus A1. Therefore, relay BR (2) operates and closes its contacts BR (2) which operate relay SR (2). The contacts of relay SR (2) energize the tap changer motor of Unit 2 to operate it in the raise direction.

As soon as the tap changer starts to operate, cam-operated contact 120 (2) closes the sealing circuit to relay SR (2), so that the tap changer will continue to operate even though BR is de-energized.

As the operation continues, step-by-step switch SC of Unit 2 is mechanically operated by the tap changer so that its contact 1 is open and relay BR (2) is de-energized.

As the next position is approached, switches SA, SB and SC being driven in synchronism connect to contact 2 and as the next position is reached the cam operated switch 120 (2) opens and de-energizes relay SR (2) so that the tap changer stops on position.

The circuit through SB of Unit 1 and SB and SC of Unit 2 is now opened so Unit 2 will make no further operations. Also, the circuit through SA of Units 1 and 2 is closed so that Unit 1 can operate again if the voltage regulating relay requires further operation.

If the voltage regulating relay had been assumed to close contacts PL instead of PR, the operation of the two units would have been the same as described except that relays TL and BL and step-by-step switch SB would have controlled the operation.

APPLICATION TO STANDARD UNIT SUBSTATION CONTROL

The circuit and equipment as described above is applied to the standard unit substation tap changer control as shown in I.L. 48-900-12.

In Fig. 3, the step-by-step switch circuit as described above is applied to the control circuits of I.L. 48-900-12, using the nomenclature and symbols of the Instruction Leaflet and Fig. 2.

In Fig. 3, duplicate equipment is shown on each unit so that either may be slected as the master unit and the other as the follower unit. The switch PS is the paralleling selector switch and is shown in Fig. 3 with Unit 1 as the "Master" and Unit 2 as the "Follower". The "Sequence of Operation" chart in Fig. 3 shows the contact arrangement for each of the three positions, namely: Independent, Parallel Follower, and Parallel Master. The purpose of the contacts PS1 to PS21 is as follows:

a. PS1 to 8 connects the step-by-step switches SB and SC so that proper step-by-step operation is obtained, switches 2, 4, 6 and 8 are closed on the master unit, and switches 1, 3, 5 and 7 are closed on the follower unit.

b. PS9 connects switch SB to the control relays on the follower unit to permit operation by the step-by-step switches.

to switching operations. If units are to be separated for independent operation, the changeover is manual and is as follows:

a. Change current transformer connections by means of terminal block jumpers.

b. Change the circuit breaker relay connections so that the tie breaker will remain open.

c. Set the parallel-independent switch on both units on "Independent".

d. Reset the compensators of both units to the required setting for each feeder.

REPAIR PARTS

Order renewal parts from the nearest Westinghouse office, giving serial number, type, and S.O. or style number stamped on the main transformer nameplate and also a complete description of the parts required.

WESTINGHOUSE ELECTRIC CORPORATION
SHARON PLANT • TRANSFORMER DIVISION • SHARON, PA.

Printed in U.S.A.