

# Application Tip

## $\Delta$ VAR™-1 Method of Paralleling Equipment Adjustments—M-2001 Application (M-0115A, M-0127)



1. Put the M-0115A **Parallel/Independent** switches in the **Independent** position and check the independent operation of the controls. **Put the M-0115A sensitivity settings on N.** (NOTE: All M-0115A sensitivity settings **MUST** always be the same for proper operation.)

2. With load on the transformer and zero R&X LDC settings, increase the R **LINE DROP COMPENSATION** setting on each control individually. **The control should call for a raise.** This will be indicated by the M-2001 Raise LED; you may choose not to wait for the timeout and actual tapchange before resetting to zero. If the control does not call for a raise or calls for a lower, reduce the LTC settings back to zero and check the CT polarities.

3. (OPTIONAL) Repeat with the X **LINE DROP COMPENSATION** setting. **Assuming** a lagging load power factor the same results should occur.



4. **SET** the M-2001 controls to identical **BANDCENTER, BANDWIDTH and TIME DELAY** settings and return the R and X **LINE DROP COMPENSATION** settings to **0**. Manually place the transformer taps on the position (Tap) which minimizes the circulating current. *(Depending on the bandwidth setting, there may be two or three or more relative tap positions which have the same minimum circulating current. Choose the one which results in a voltage closest to the bandcenter setpoints on the controls.)*

5. Put the M-0115A **Parallel/Independent** switches in the **Parallel** position. No operation changes should occur. Read each M-2001 **CONTROL CIRC I** value which should be near zero amps if the transformers and current transformers are properly matched. If there is a small circulating current, one must be **LEAD** and the other **LAG**. (In multiple transformer applications, the sum of **LEAD** currents should be approximately equal to the sum of the **LAG** currents.) The **CONTROL LOAD I** in each M-2001 should be approximately equal. If they are not, recheck wiring.



6. (If an **AUTO/MANUAL** switch is available, step 6 may be completed in **MANUAL** mode;) Manually raise one transformer one tap and lower another transformer one tap. Both related M-2001 **CONTROL CIRC I** values should remain approximately equal, one **LAG** and one **LEAD**. Each M-2001 **CONTROL LOAD I** should remain approximately unchanged.

A) If either, but not both, transformer operates toward the other (or is indicated by the M-2001 **RAISE** or **LOWER** LEDs in the case of **MANUAL** mode), the sensitivity settings (N) are appropriate.

B) If both transformers operate back to the original tap positions (or is indicated by the M-2001 **RAISE** or **LOWER** LEDs in the case of **MANUAL** mode), the sensitivities should be one step **LESS SENSITIVE** and step 3 retried.

C) If neither transformer operates (or is indicated by the M-2001 **RAISE** or **LOWER** LEDs in the case of **MANUAL** mode), the sensitivities should be one step **MORE SENSITIVE** until one transformer operates toward the other.

D) Continue until A), above, is satisfied. (Confirm operations in the **AUTO** mode;)



7. In the  $\Delta$ VAR<sup>TM</sup>-1 application, the absolute magnitude of the circulating current, which energizes the M-0127 overcurrent relay, is not necessarily indicative of inappropriate tap positions. Analysis of possible transformer KW load unbalance is required to find a suitable setting (if any) for this device.

The transformers may be manually returned to the same position (preferred).

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