



GE Industrial & Power Systems Steam Turbine

Power/Load Unbalance Circuit and Relays

I. GENERAL

Figures 1 and 2 show the analog and logic circuitry. For actual valves, circuits and locations, refer to Power/Load Unbalance Circuits for the machine.

A POWER/LOAD UNBALANCE signal is used to detect rapid acceleration of the unit before a measurable speed change has taken place.

This signal is used to actuate the dump valves of the control valve servomotors by means of solenoid valves, and to reset the desired load signal to zero in order to start closing the intercept valves rapidly on a small speed increase.

The power of the turbine is measured by a pressure signal from the cold reheat pressure.

The load of the generator is measured by a combined signal derived from the three current transformers. The object is to detect a power/load unbalance of approximately 40% or more. High accuracy of the load measurement is not required, therefore, a current signal rather than a wattage signal is being used.

II. DESIGN

The three voltages making up the power signal and the pressure signal are summed in a resistor network. If the result indicates more than a 40% unbalance between power and load, the voltage comparator will energize indicating a power/load unbalance. Relays will be energized which will:

- A. Remove the desired load signal from the inputs of the valve amplifier by grounding it.
- B. Run the load reference motor back to the near zero load position.
- C. Prevent the load reference motor from being run in the increase load direction.
- D. Prevent transfer from Full-arc to Partial-arc while the reheater is blowing down.
- E. Block any opening signal to the control valve servo valves while the disk dump valve is resetting.
- F. Actuate the dump valves on the control valve servometers.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes the matter should be referred to the GE Company.

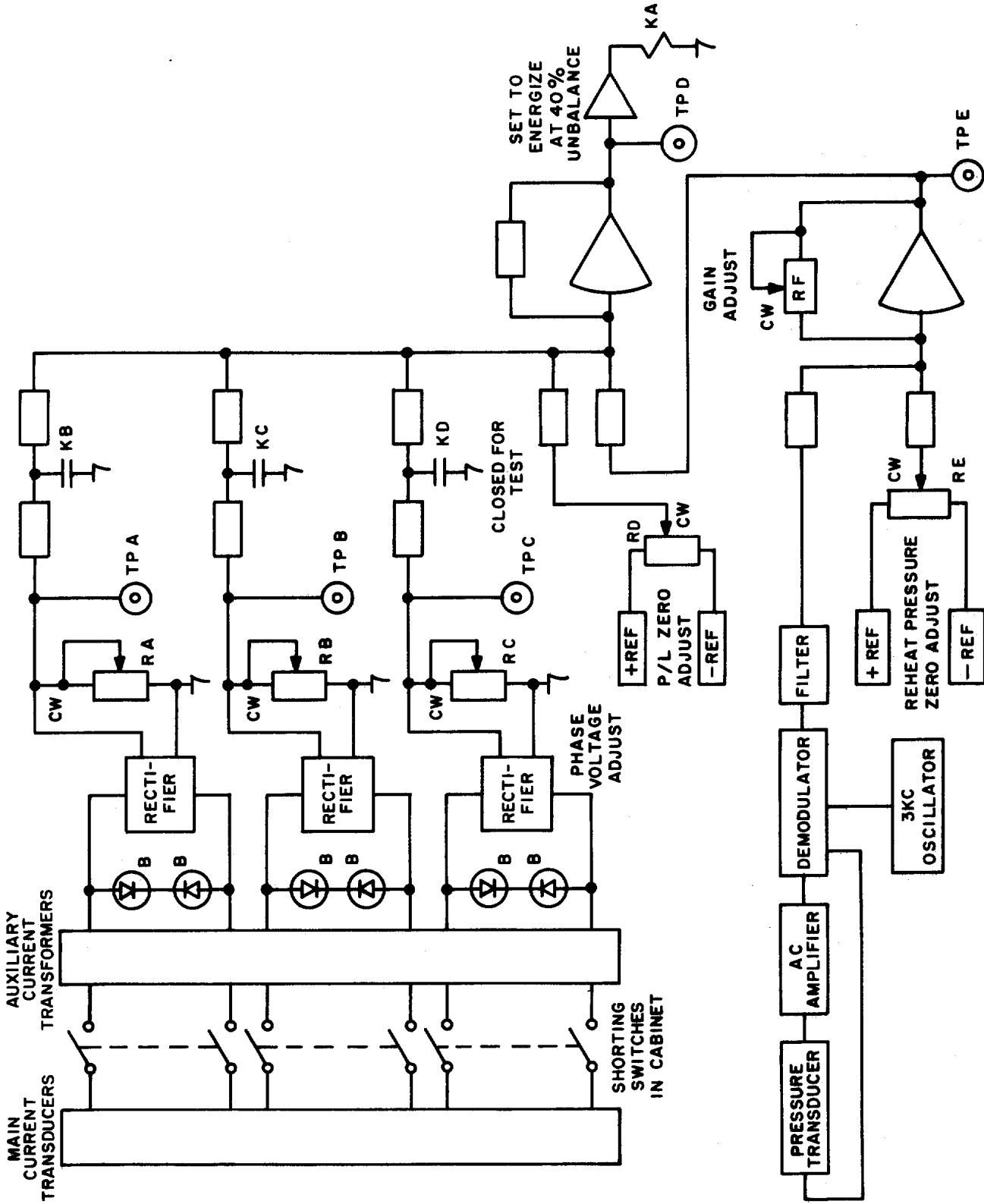


Figure 1. Power/Load Unbalance Demodulator

The power/load unbalance circuits can be tested up to the power/load unbalance light, but excluding the power/load unbalance relays. A test push-button is used to ground the current signals and simulate a loss of load. When the test button is released, there will be a delay of 5 seconds before the relay actions return to normal to prevent accidental valve closure while the voltage comparator is resetting.

III. OPERATION

When the power/load unbalance on the unit exceeds 40% the power/load unbalance relays will be actuated.

If the load returns quickly (for instance by quick closing breaker after clearing a fault) the power/load unbalance relays will quickly reset and the valves will reopen to the position given by the load reference that has been run back for only a short period, and the speed error signal. The valves will reopen at their normal opening rate.

If the load does not return within approximately 45 seconds, the load reference will have run back to near zero and the power/load unbalance relays will stay picked up until the reheat pressure drops to approximately 40% of rated reheat pressure. When the power/load unbalance relays drop out, the load reference signal (almost zero) will be restored to the valve amplifiers and approximately 1 minute later the transfer from PA to FA will be permitted if the FA/PA transfer is on automatic. The unit will then be close to rated speed in FA admission, ready to be resynchronized.

IV. TEST

For the Power/Load Unbalance Circuit Test, the test button on the adjustment panel is depressed. The power/load unbalance light should come on almost immediately.

If the light should not come on it must be assumed that the circuits are not working properly. In this case either of two lines of action can be taken:

- A. Reduce load to below 40%: If load should be lost now, the unit would not trip on overspeed but it would run at about 2% overspeed after having blown down the reheater.
- B. Remain at whatever load is desired and realize that on loss of load the unit will be tripped on overspeed. In particular, if full load is lost, the peak speed may be close to 120% of rated speed.

It is not unsafe but somewhat undesirable to run with the power/load unbalance relay out of order.

Weekly testing of the power/load unbalance circuits (above 40% load) is recommended.

V. ADJUSTMENTS

A. Phase Voltage Adjustments

When the generator is producing rated current, RA, RB, and RC should be adjusted until the voltage at the respective test point is + 10.00 volts measured on a dc voltmeter.

B. Power/Load Unbalance Zero Adjust

This should not normally require field adjustment. Ground the current and pressure inputs. Monitor the voltage at TPD. If it is not 0.00 volts, adjust RD.

C. Reheat Pressure Zero Adjust

To make this adjustment, the Reheat Pressure Transducer must be open to atmosphere. Adjust RE until the voltage at TPE is 0.00 volts.

D. Reheat Pressure Gain Adjust

When the zero has been set, and rated pressure is applied to the transducers, adjust RF until the voltage at TPE is -5.00 volts.

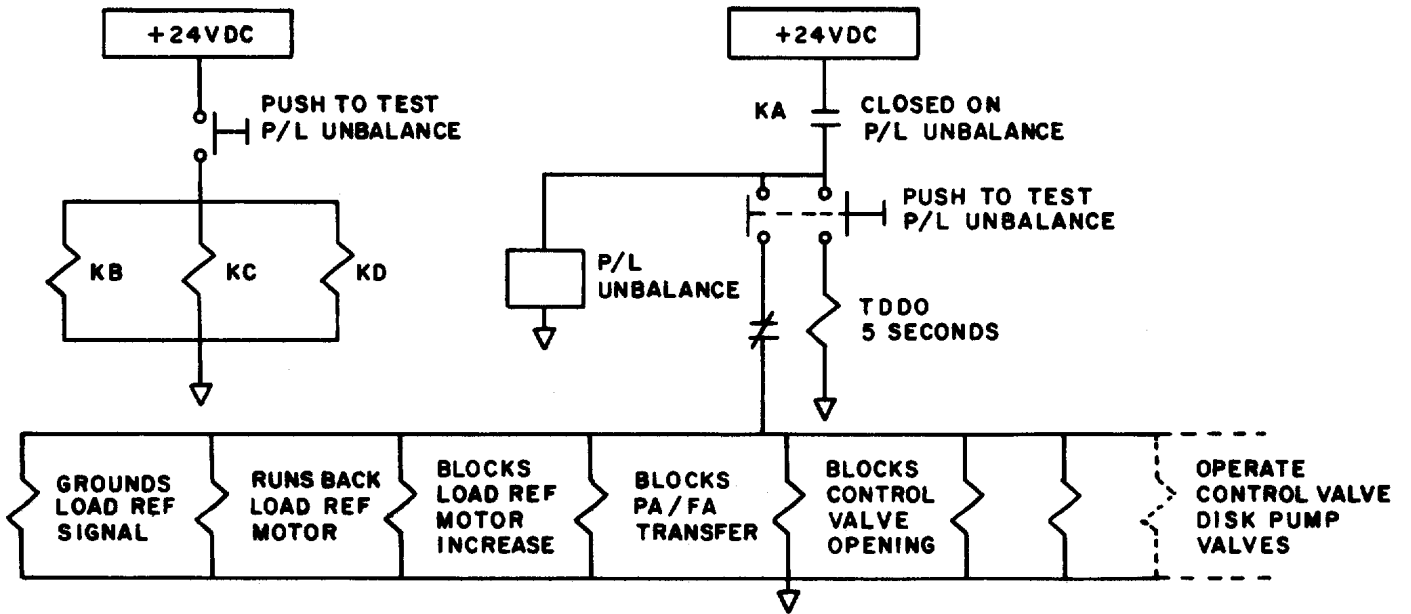


Figure 2. Power/Load Unbalance Logic



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