[0100] Instead of manually switching each rectifier **24** off and on, it is common in the CP industry to install a current interrupter **25** into the rectifier **24** under investigation. A current interrupter is a device that interrupts the output from the rectifier **24** in a periodic fashion and is typically programmable so that the length of the on and off cycles can be adjusted. By installing an interrupter **25** into a rectifier **24**, such as **24***a*, it is therefore possible to visit test stations TS**1** to TS**8** and measure the influence of rectifier **24***a* being interrupted. The influence of rectifiers **24***b,c* is then measured by moving the interrupter **25** to each of these rectifiers in turn and re-visiting test stations TS**1** to TS**8**.

[0101] In the prior art, to determine rectifier influence at each test station in **FIG. 9**A, an interrupter must be moved from rectifier to rectifier and each of the test stations TS**1** to TS**8** visited for pipe-to-soil potential measurements a total of three times. If the "instant off" value needs to be measured at test station TS**1** to TS**8** also, it is necessary to install interrupters **25***a,b,c* into all three rectifiers **24***a,b,c*. Interrupters **25***a,b,c* are programmed to produce a unison switching cycle **112** described in **FIG. 9B** which causes each of rectifiers **24***a,b,c* to switch "on" and "off" in unison. A fourth visit to each of test stations TS**1** to TS**8** is required to measure the "instant off" value during the "off" cycle. Currently no device is available that will allow measurement of the influence from each rectifier and the "instant off" pipe-to-soil potential without the multiple visits to test stations and rectifiers described above.

[0102] The apparatus and methods of the present invention include a system which can be programmed to obtain the rectifier influence, the "on" potential, and/or the "instant off" potential at each test station **40** during a single visit to each test station **40**. This system furthermore has the capability of providing a switching cycle on a plurality of influencing rectifiers **24** allowing the simultaneous measurement of rectifier influence, "on" potential, and "instant off" values at test stations **40**, all collected during a single visit to the test stations **40**. At present, there is also no way of obtaining the rectifier influence in conjunction with "on" potential, and "instant off" potential values in a single visit to the test stations **40** because the rectifiers **24** are either "on" or "off" as shown in **FIG. 9B**.

[0103] Referring now to **FIG. 9**C, there is shown a preferred method of the present invention. Considering the CP configuration described in **FIG. 9**A, three current interrupters **25***a*, **25***b*, **25***c* can be programmed to produce a consecutive switching cycle **114**. Consecutive switching cycle **114** will allow the measurement of the influence of each of the three rectifiers **24***a,b,c* as well as the "instant off" and "on" pipe-to-soil potential during a single visit to each of test stations TS**1** to TS**8**. The time periods, labeled "a" through "d", for the "off" and "on" settings for the three interrupters **25***a*, **25***b*, **25***c* are as follows:

[0104] (a) During time period (a), all rectifiers **24** shown in **FIG. 9A** are switched off to record the "instant off" potential.

[0105] (b1) During time period (b1), rectifiers **24***b,c* are on and rectifier **24***a* is off and the influence from rectifier **24***a* is recorded.

[0106] (c1) During time period (c1), all rectifiers **24** are on to provide a stabilization time between time periods (b1) and (b2).

[0107] (b2) During time period (b2), rectifiers **24***a,c* are on and rectifier **24***b* is off and the influence from rectifier **24***b* is recorded.

[0108] (c2) During time period (c2), all rectifiers **24** are on to provide a stabilization time between time periods (b2) and (b3).

[0109] (b3) During time period (b3), rectifiers **24***a,b* are on and rectifier **24***c* is off and the influence from rectifier **24***c* is recorded.

[0110] (d) During time period (d), all rectifiers **24** are on. Time period (d) is typically of sufficient duration to allow the "on" pipe-to-soil voltage potential to be measured. It should be noted that the "on" potential can also be measured during time period (c), provided time period (c) is of sufficient duration to carry out this measurement.

[0111] The difference between the pipe-to-soil potential measurements during time period (d) and during time periods (b1), (b2) and (b3) will therefore provide the influence (in mV) of rectifiers **24***a,b,c* while the pipe-to-soil potential measured during time period (a) provides the "instant off" potential. The pipe-to-soil potential measured during time period (d) provides the "on" potential. The need for multiple visits to the same test station in the prior art has therefore been eliminated.

[0112] Using the switching cycle described above, it is also possible to measure the change in current flow back to each rectifier **24** in pipeline **10** at each test station **40** caused by switching each rectifier **24** off. This change in current flow at every test station **40** may be measured using the configuration described in **FIG. 4** or it can also be measured by alternative means such as by measuring the change in the magnetic field around pipeline **10** caused by the change in current flow.

[0113] In addition to measuring the pipe-to-soil potential at each test station, it is sometimes also necessary to measure the pipe-to-soil potential between test stations **40** at a regular distance interval. This measurement procedure is typically referred to as a close interval survey (CIS). A CIS is routinely performed in the pipeline industry and is typically performed on a pipeline where the pipe-to-soil potential data collected at test stations (typically spaced 1 mile apart) alone is deemed inadequate and a higher density of data points is required. The spacing of data collection points on a CIS varies, but 2.5 to 5 foot intervals are typical. In the prior art, a CIS is typically performed while switching all influencing rectifiers **24** on and off in unison as shown in **FIG. 9B** so that the "on" potential and also the "instant off" potential can be recorded at regular measurement intervals.

[0114] Referring now to **FIGS. 9A, 9B**, 9C and 9D, the switching of rectifiers in unison described in **FIG. 9**B and the consecutive switching of rectifiers shown in **FIG. 9C** can be combined to produce the time cycle described in **FIG. 9D**. By using the time cycle described in **FIG. 9**D, it is now possible to perform a CIS between TS**1** and TS**8** and to measure the "on" and the "instant off" potentials at regular distance intervals during unison switching cycle **112** in **FIG. 9**D and then to also measure the influence from each rectifier being interrupted during consecutive switching cycle **114** in **FIG. 9D**. After completion of at least one consecutive switching cycle **114**, unison switching cycle **112** is preferably repeated and so on.