

Operating¹ IBM/ITR master² with three wire hourly corrected system with non-IBM/ITR slaves.

Question: is it possible to operate UK-type slaves with the IBM/ITR master, accepting that the hourly correction will not work?

Solution: It is possible to operate UK *unipolar* slaves³ (f.e. GENTS, GPO) with the IBM/ITR master but it takes some (reversible) modification in both master and slave. A minute impulse slave requires no modification.

Modification of the master:

- The minute pulse between the A-C line is influenced by the hourly supervised system. Therefore this system has to be set out of action. The simplest way to do so is to mechanically translate the advance/stop switch to the left so it cannot be actuated at 59'¹⁰. Undo both screws and put the switch one hole to the left. Put the other screw back in the now empty hole.
The result is a minute 24v DC time signal between the A and C line every minute of the hour.
- The clock is operated in the **Run** mode. The **Advance** mode will work.

Modification of the slave(-s):

- The GENTS/GPO slave has to be modified from *half-minute* to *minute* pulse operation. Setting the IBM/ITR master to half minute pulse is possible in principle but requires modification of the cam that closes the minute contact. Alternatively, use another make of minute impulse unipolar slave.

The electrical operation:

There are two options for the electrical operation:

1) The IBM lines A-C drive the slave(s) directly

The IBM/ITR slaves are operated in parallel at 24 volt DC. With a coil resistance of approx 800 Ohms this results in a current of approx 30 mAmp. In contrast, the Gents/GPO slaves are set in series. The coil resistance is approx 4 Ohms, the required current is 0.22 Amp and is critical for functioning flawlessly. Unfortunately, this current of .22 Amp. is *7 times* the operating current of *one* IBM slave. Therefore the current in the slave circuit has to be set to .22Amp with a adjustable resistor of approx 125 ohm. The master relay should be able to handle this as its max current is approx 1,5 Amp.

In this setup, the master is the time transmitter *and* power supply for the slave circuit.

2) The IBM lines A-C drive the slaves(-s) indirectly

The lines A-C drive the coil of an external 24 volt DC relay. This relay connects every minute the slaves to an external power source with adjustable resistor for current regulation. Now you can use, for example, the adjustable resistor and power source of a GENTS circuit or a switching power supply.

In this setup, the master is only the time transmitter as the slaves are powered in a separate circuit, with a separate power supply. A circuit could also be added to fire two pulses for every one received from the clock, allowing a 30 second impulse slave to be used unmodified.

Although both solutions work, I prefer the *indirect* way of switching the slaves via the relay as it keeps the current in the master low and both systems are electrically separated.

Furthermore, I observed more delays in the slaves when they were operated directly from the IBM master, compared to the indirect way with a 24 volt DC relay and external power supply. This might have been predictable as possibly the reason IBM introduced the hourly supervision system.

Fons Dehing

¹ We have investigated the operation of the IBM masters with UK slaves. The solutions works, but were not foreseen by IBM. The solution is to my best knowledge, but you are responsible yourself for the application.

² We tested the operation using an IBM 18.9 master (24 volt) and GENTS - and GPO slave.

³ Continental slaves operating with alternating polarity will not function with the IBM/ITR master.