



kV Meter Remote Communications

Domestic Telephone

The kV Meter is connected to the ordinary telephone system by installing either a kV Internal Modem or a kV RSX connected to an external telephone modem. The kV Internal Modem connects directly to the telephone line and communicates at 300, 1200, and 2400 bps (bits per second).

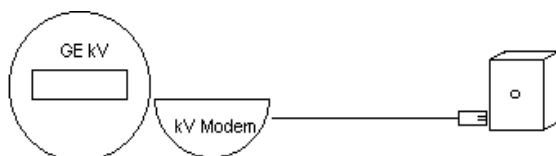


Figure 1. kV Internal Modem Connection to the Telephone Line

The kV Internal Modem also provides a master/slave feature that adds the capability to connect up to 5 meters to the same telephone line. Each of the meters is programmed with a unique address. All master/slave meters in a cluster may be read during the same telephone connection.

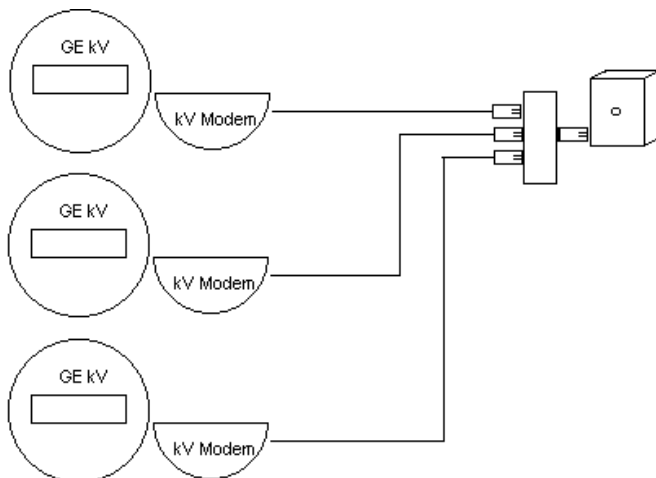


Figure 2. kV Internal Modem Master/Slave Configuration

The kV RSX can communicate at up to 9600 bps, but has no master/slave capability. It requires the use of an external telephone modem.

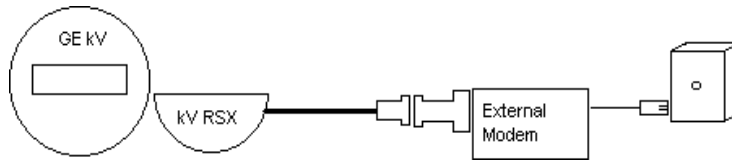


Figure 3. kV RSX Connected to an External Telephone Modem

When either the kV Internal Modem or the kV RSX is installed in the kV, the meter can be read and programmed using the Smartcoupler. To read or program the meter over the telephone line, it is necessary to either call the meter or program the meter to initiate a call to the host computer's modem. Once the telephone connection is made, the host computer may communicate with the kV Meter using MeterMate, MV-90, or a third party developed application.

International Telephone

Any equipment that connects to the telephone line must do so in a manner that prevents that equipment from degrading or disrupting the telephone service. Modems incorporate a specially designed interface called a DAA to isolate the equipment from the telephone line. Not all countries have telephone systems that are compatible with those in the United States. These systems require modems with compatible DAA's.

The kV Internal Modem may be used to connect the kV Meter to telephone lines in countries with systems compatible with the U.S.A. The kV RSX is used to connect the kV Meter in countries that have different telephone systems. The kV RSX allows the use of a compatible external modem to connect to the foreign telephone system. The important requirements are that the external modem support the RS-232 interface standard and obey the basic Hayes AT command set.

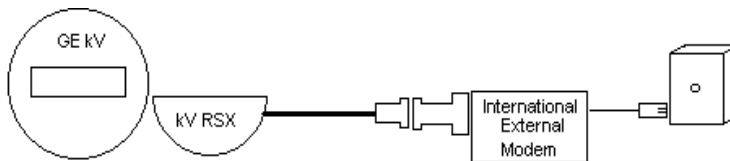


Figure 4. kV RSX Connected to a Foreign External Modem

The kV RSX may also be chosen if the kV Internal modem speed is too slow for the application. Once the kV Meter has been interfaced to the foreign telephone system, MeterMate can be used for reading and programming.

Cellular

The cellular telephone system provides a wireless connection to the landline telephone system. The most common system has been around since the 1980's and is an analog system. The kV meter is connected to this first generation wireless network by installing a kV Internal Modem into the kV meter. The kV Internal Modem telephone cord is connected to the data port of the cell phone.

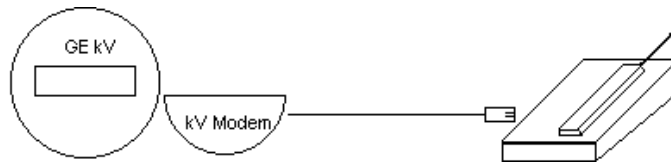


Figure 5. kV Internal Modem Connected to the Data Port of a Cell Phone

The kV is read and programmed with a cell phone in much the same way as over a landline telephone. The kV Internal Modem setup strings can be programmed to compensate for the connection delays encountered using wireless.

The noise encountered during an analog cellular session tends to limit the maximum rate at which data can be effectively communicated. Depending upon the service and location, 2400 bps data rates may or may not be possible.

Digital cellular

Second generation cellular telephone systems digitally code the voice information, but not all digital cellular services provide digital data service to the customer. Of the services that do provide digital data, not all use the same technology.

When considering digital cellular for kV Meter communications, it is important to determine whether the wireless service provides digital data capability and, if so, how the user connects the meter to the wireless device. The kV meter has been tested with Omnipoint's PCS GSM 1900 wireless service, which provides digital data service along with voice capability. The meter connects to the wireless service by plugging the kV RSX communications cable into the digital Sagem cell phone. This phone provides integrated data transmission. When it comes to communicating digital data, this cell phone appears to the kV RSX as an external telephone modem.

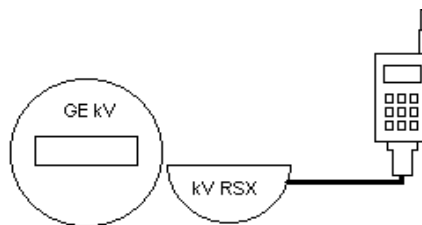


Figure 6. kV RSX Connected to the Serial Port of the Sagem Phone

To the user, there is no difference between communicating with the meter over Omnipoint's PCS (GSM 1900) and a standard telephone line.

PCS

PCS refers to Personal Communications Services, which is one of the emerging third generation wireless systems for handheld devices. There are many forms of PCS being offered today. kV Meter communication over Omnipoint's PCS system has been demonstrated, as discussed above. Other PCS services have not been evaluated with this product, therefore, it is important to identify the type of PCS service before concluding that the current solution is applicable. The system under consideration must use a communications device which features an RS-232 serial port and responds to the basic Hayes AT

command set. If the cellular system is not GSM-1900, wireless communications tests must be performed to verify whether the kV's protocol is compatible with the system.

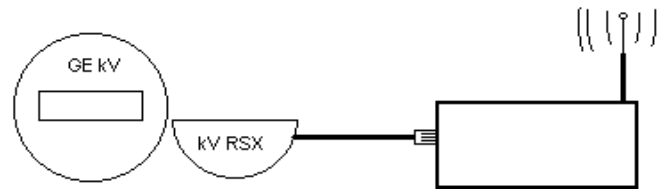


Figure 7. kV RSX Connected to the Serial Port of Omnipoint's Data Terminal Module

CDPD

The CDPD wireless data service utilizes the existing analog cellular telephone network to send and receive data. It shares cellular channels with voice communications, making use of unused air time. CDPD packages the data in the same format used for data communicated over the internet. Several manufacturers offer wireless modems that connect to a computer much like an external telephone modem. Tests have shown that kV meter reading and programming is prohibitively slow over CDPD wireless for several reasons. A major factor is the way the meter data is packaged for CDPD communications. Also, there are many unavoidable delays in CDPD communications due to the round trip delay over wireless and the sharing of the channels with voice communications. Currently, CDPD is not an effective solution for reading and programming the kV meter. Extensive changes to the third party CDPD modem software and development of special host communications software are required to make CDPD viable for the kV.

Third Party Wireless AMR Solutions

Companies like Itron continue to develop proprietary solutions to serve the AMR market. The boxes developed to transmit the wireless data have interfaces that work with a wide variety of communicating devices. The kV Meter, equipped with a kV RSX communications board is compatible with RS-232, RS-485 (point to point), and external telephone type interfaces to these devices. As discussed previously, the interface and the network should be tested with the kV to verify the particular solution.