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Service Note

95-001 Rev B
2 May, 2007

CONNECTING THE API ANALYZER RS-232 INTERFACE FOR MODELS 100, 200, 300 AND 400 ONLY

API analyzers use the RS-232 communications protocol to allow the instrument to be connected to a variety of computer based equipment. RS-232 has been used for many years and as equipment has become more advanced, connections between various types of hardware have become increasingly difficult. Generally, every manufacturer observes the signal and timing requirements of the protocol very carefully. Problems arise when trying to specify connectors and wiring diagrams that attach the analyzer to various devices.

The problem centers around two areas. First is the physical incompatibility of connectors. Second is the wiring of the connectors. This note will attempt to provide some guidelines for connecting the API analyzers to a variety of other equipment.

CONNECTORS:

There are a wide variety of connectors and cables that are specified to operate with the RS-232 protocol. This is because electronics have decreased in size over the years and connectors have been downsized to match.

The two most common connectors in RS-232 are the 9 pin (DB-9) and 25 pin (DB-25)"D" connectors, so named because the shell is shaped like the letter D. The old PC and XT class machines used a 25 pin. The AT and later class machines, as well as laptops, typically use a 9 pin for COM1 and a 25 pin for COM2. The API analyzer uses a 9 pin connector. Modems typically have a 25 pin connector. Because of this fact, and because the prevalence of mouses in use on computers leaves only COM2 (a 25 pin connector) available, API includes a 9 pin to 25 pin cable with each analyzer that has the RS-232 option.

WIRING:

The RS-232 is a point to point protocol and as such it specifies two different wiring schemes depending on whether the device originates or receives the transmission. In the original spec, modems communicated with terminals and were wired as "Data Communications Equipment" or DCE. Terminals or printers received data from modems and thus were wired as "Data Terminal Equipment" or DTE. As technology has progressed, the definition of a piece of equipment as DCE or DTE has become ambiguous. API analyzers are wired as DTE (like a printer) so they can connect directly with a PC (DCE). As can be seen, this presents difficulties if you hook a printer to the instrument, as they are both DTE.

To make matters more difficult, our friends at IBM decided to change the wiring when they instituted the DB-9 connector. This means that the decision to use the DB-9 or DB-25 connector on your PC becomes more complicated.

To help address these problems, three examples are given. (Note: in order to work directly with a PC, modems that are sold to connect to PC's are generally wired as DTE, this is opposite of how older, non-PC modems are wired. Be sure you know which way your modem is wired.).

CABLES AND ADAPTERS:
Cables & Adapters come in 4 general types:

1 . Cables - Cables are provided in various lengths from 6 to 50 feet. In most cases they have a male connector at one end and a female at the other. Variations on this are cables that are both a cable and an adapter. For example, the cable provided with our analyzer adapts a female DB-9 to a male DB-25 connector. It also contains a Null Modem, in that pins 2 and 3 are swapped. Cables which are straight through, i.e. 9 pin to 9 pin or 25 pin to 25 pin, usually don't contain a null modem. Cables which are adapters usually do.

2. Gender changers - convert a male connector to a female connector or vice versa. They do so WITHOUT changing the wiring.

3. Adapters - These change from one type plug (DB-9) to another type (DB-25). These will almost always contain a null modem in order to meet the IBM "spec" of having pin 2 of the 25 pin and pin 3 of the 9 pin both being transmit.

4. Null modems - here the connector changes the internal wiring so that DTE devices become DCE or vice versa. The main internal change is swapping pin 2 and 3 so that data is transmitted and received on opposite pins.

CAUTION: Null modems can also combine gender changer or adapter features in the design. When making up an adapter cable be careful to note what you are using; especially with combination null modem/adapter connectors.

Example 1: Connecting the API analyzer to an IBM-PC AT compatible computer.

In the case of the 9 pin, the PC is DCE and the analyzer is DTE, therefore a straight cable, (no null modem) is required. The cable which comes with the analyzer can be used if you purchase a 9 pin to 25 pin adapter which is female on both ends. If the PC is using a DB-25, the PC is DTE and the cable which was provided with the analyzer will work because it contains a null modem, although you will need to purchase a gender changer, (25 pin to 25 pin, BOTH ends female).

Example 2: Connecting the API analyzer to a serial printer.

In this case, both devices are DTE, so a "Null Modem" will have to be inserted in the line to change one of them to a DCE. If using the API provided cable, connect the DB-9 end to the API. The cable has a Null Modem built in, so you won't need to buy one. Connect a gender changer to the DB25 end if needed for the printer.

Example 3: Connecting the API analyzer to a modem.

Every external modem I have seen has a 25 pin connector on it. If yours is a 9 pin at the modem, try to use example 1 to make it work. If you have difficulty, contact API for assistance.

The older, non-PC style modems are wired as DCE. This is then similar to example 1.

The odds are the modem you purchase is a PC-compatible, and will be wired as DTE. In this case, you will use example 2 to connect.