A re you having this problem: You have two IBM PC's or compatibles. Machine A has one or two 5.25-inch drives, and machine B has one or two 3.5-inch drives? You might even have a hard-disk drive on one or both. You can get all kinds of software on 5.25-inch floppy disks for use on machine A, but you can't move it into machine B. Perhaps machine B is a laptop, and you've saved some work on a 3.5-inch disk or the hard drive, and you'd like to transport the work into machine A.

Many articles have been written about adding drives, so I won't cover that topic here.

Second, you could get a friend with both size drives in the same machine to make 3.5-inch copies of your 5.25-inch diskettes, or vise versa. You must be sure the target format is readable in your

in about 50 feet of each other, you could use another method, which is none of those things: simply wire the two computers directly together and use a high-speed transfer program on each machine. That requires the proper cable and dedicated software. This article will describe how to do that, and

If you have a couple of computers at home you can connect them to form a more powerful workstation. Read how to inexpensively break down the walls between them so they can communicate and share files.

BY FRED BLECHMAN
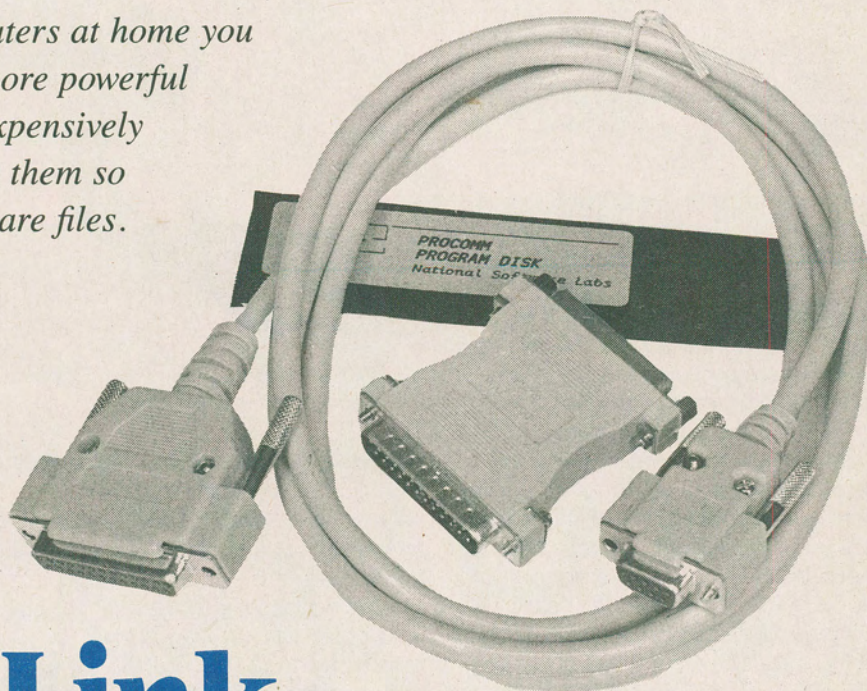
The Cheap-Link File-Transfer System

chine A, but you can't move it into machine B. Perhaps machine B is a laptop, and you've saved some work on a 3.5-inch disk or the hard drive, and you'd like to transport the work into machine A. You can try to put the two machines as close to each other as possible, but osmosis won't work.

You have at least four alternatives: You could add a disk drive to one machine. That is expensive (about $150 for an external drive, power supply, and perhaps a new controller board and cables). Further, you'll find yourself stepping gingerly through a minefield of compatibility problems (switch settings, software drivers, cables, etc.) However, if you already own the hardware and know what you're doing, that might be the most "convenient" arrangement.

machine: A 1.44MB 3.5-inch microdiskette can not be read by a 3.5-inch 720K drive, and a 1.2MB 5.25-inch diskette can not be read by a 360K 5.25-inch drive. This method requires a friend with the right equipment, who is also willing to give you his time and effort. A local computer store might offer you the courtesy of using its equipment to make disk conversions.

Third, you could transfer files between computers with two modems, two phone lines, and a communication program on each machine. That is slow and cumbersome, but about the only practical method if the two machines are not near each other.

Those three methods are either expensive, clumsy, slow, or all of the above. But if the two machines are with-

how it can be done for only $25–$40.

Expensive Link. There are several commercial packages available to implement the last method. They provide special cables and software, and run in the $100–$150 range.

LapLink III (Traveling Software, 18702 North Creek Parkway, Bothell, WA 98011; Tel. 206-483-8088. Suggested list price: $149.95) consists of a six-headed cable and special software. Each end of the cable has three connectors: one to mate with a DB-25 (25-pin) serial port, one for a DB-9 (9-pin) serial port, and one for a Centronics-type 36-pin parallel port. I haven't personally used it, but all the reports I've read have been very positive. If you are willing to spend the money, LapLink III is certainly an option.

A
PC/XT/AT/PS2
OR COMPATIBLE

— UP TO 50' —

CONNECTOR TYPE
& GENDER MUST MATCH

B
PC/XT/AT/PS2
OR COMPATIBLE

9/25 ADAPTER
MAY BE REQUIRED
AT EITHER END

NULL MODEM
ADAPTER REQUIRED AT
EITHER END UNLESS
NULL MODEM CABLE
IS USED

SERIAL CABLE-ONLY 3 WIRES REQUIRED (SEE TEXT)
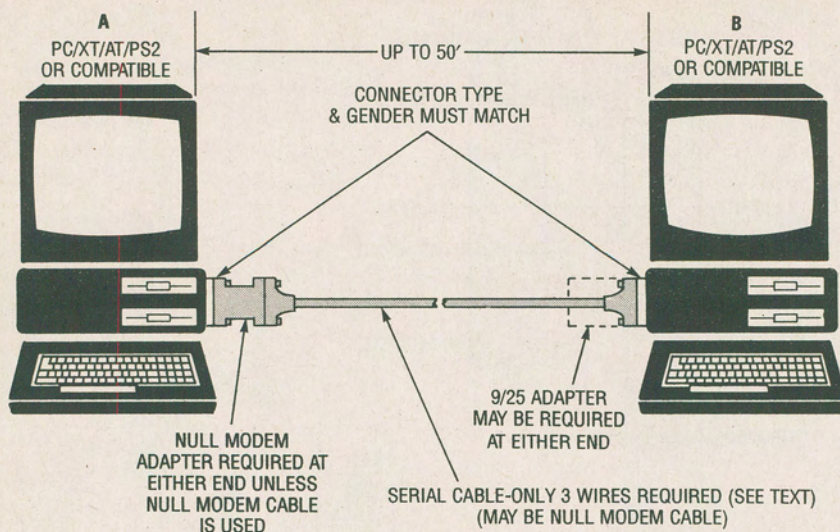(MAY BE NULL MODEM CABLE)

Fig. 1. To connect a couple of computers you can use a null-modem cable or a null-modem adapter with a null-modem cable. By selecting the hardware wisely you can connect DB-25 equipment to DB-9 equipment.

Fastlynx (Rupp Corporation, 835 Madison Ave., New York, NY 10021; Tel. 212-517-7775. Suggested list price: $149.95) is another option. Two cables are provided. One cable has the DB-9 and DB-25 serial connectors on each end; the other cable has Centronics parallel connectors on each end. The serial cable and special software provided can transfer at 200,000 bits per second (bps), while the parallel transfer can handle a blazing 500,000 bps. It a character, with error checking, uses about ten bits, then 500,000 bps is about 50,000 characters per second! (Note: The term "baud" is frequently used in place of "bits per second." While not identical, the differences are not significant for this application.)

There are others (Brooklyn Bridge and PC Link are two names that come to mind) that provide cables and software to allow you to tie two IBM PC-compatible machines together to transfer files. Most offer features in addition to file transfer, such as reading directories and basic DOS functions. They work fine, but may provide far more than you need. The cables are intended to mate with most common connectors. Since you only have a specific set of connectors, you don't need most of the cabling. The manufacturers, because of competition, add more and more features (and confusion) to their products.

Don't get me wrong; if you have a requirement to transfer many large files very often, the software provided with these packages is powerful. However, if your needs are modest, you may be paying for overkill.

Cheap Link. Over the years I've dealt with over a dozen different microcomputers, and have transferred programs and files between them in various ways. Trust me—it can either be easy, or a nightmare. I think I've come up with the ideal combination of hardware and software that will let you transfer files between PC compatibles at 115,200 bps, without problems, and it won't devastate your budget.

You will primarily be dealing in two areas: hardware and software. The hardware is the biggest potential problem, but I've reduced that down to some relatively simple instructions for you to follow. The software could be a problem, but not if you use the program I recommend.

Hardware. The first step to linking com-
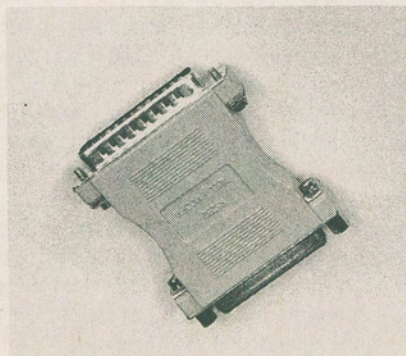
A null modem adapter is easy to use. Just put it in the signal path and it's ready to go.

puters is to look at the rear of your two computers. They must each have a serial port (usually referred to as "RS-232" or "RS-232C") and the ports must both be IBM PC-compatible serial ports.

Incompatibility may not be physically obvious, since serial (and parallel) ports on many different types of computers use a similar connector. For example, the DB-25 connectors on a TRS-80 Model I, III, 4, 4P, or 4D are not IBM compatible. The Sanyo MBC-55X also uses a DB-25 connector for its serial port, and although it is an MS-DOS machine, the serial port is not IBM PC-compatible.

Generally speaking, determining if your serial port is IBM PC compatible is not difficult. If your computer runs most IBM PC programs, it probably has a serial port, and it should work fine with Cheap Link.

Second, you should determine the type of connectors you will need. Typically, the PC serial-port connector is a 25-pin DB-25 or a 9-pin DB-9. Furthermore, it is usually the male gender—it has pins rather than holes. The holes are considered "sockets" in this context. Usually these connectors are referred to as DB-25P and DB-9P (the "P" stands for "pin"). The mating connectors are DB-25S and DB-9S (the "S" stands for "socket"), respectively.

You can get those connectors already attached to cable. Such cabled connectors often have the suffix of "M" for "male" and "F" for "female." There does not seem to be a hard and fast rule for using F and M rather than S and P, so be familiar with all these suffixes.

One last thing to consider is the wiring of the cable. In this respect there are two basic kinds of cable: straight-through and null-modem. A straight-through cable connects the pins or sockets on one end to the same pins and sockets on the other end. A null-modem cable swaps some of the wires around.

You do need to interchange some of the wires to connect two computers together, so a null-modem cable is called for. However, the wire swapping can take place inside a small box called a "null-modem adapter" placed in line with a straight-through cable.

Null-modem adapters are useful because they not only switch wires around, but they can alter connector type (and sometimes gender) as well (see Fig. 1). They allow you to use cheap ($5 to $10) straight-through cable sporting either DB-9 or DB25 connectors and both ends. Less common, but available,

DB-25M
NULL MODEM ADAPTER
OR
DB-25F
NULL MODEM CABLE

DB-25F

TRANSMIT
RECEIVE

GROUND

TRANSMIT
RECEIVE

GROUND

DB-9F
(NULL MODEM CABLE)
OR
DB-9M
(NULL MODEM ADAPTER)

DB-25F

TRANSMIT
RECEIVE

GROUND

RECEIVE
TRANSMIT

GROUND

DB-9F
(NULL MODEM CABLE)
OR
DB-9M
(NULL MODEM ADAPTER)

DB-9F

RECEIVE
TRANSMIT

GROUND

RECEIVE
TRANSMIT

GROUND

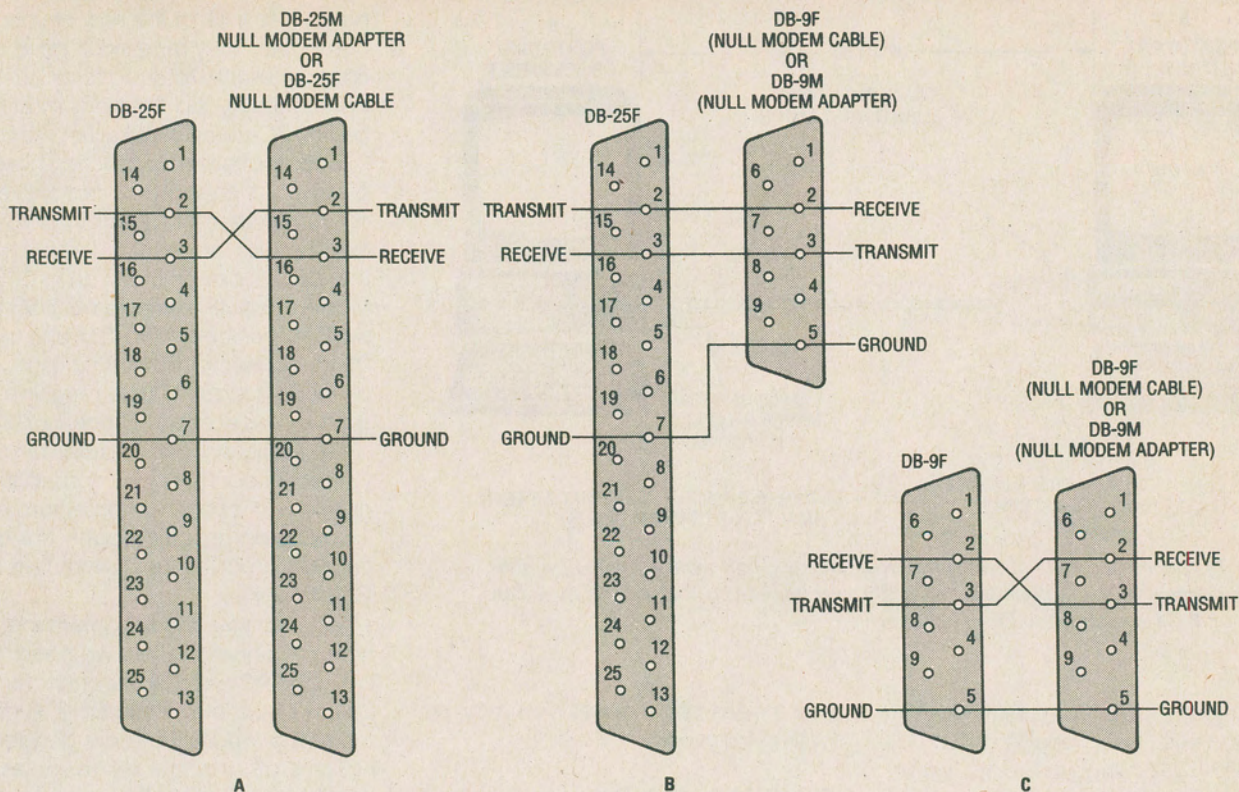A   B   C

Fig. 2. Switching pins 2 and 3 on a DB-25 straight-through cable (A) turns it into a simplified null-modem cable. On a DB-25 to DB-9 adapter/null-modem cables (B) the connections don't need to be swapped. However, they do for a DB-9 to DB-9 hook up.

is a straight-through cable with a DB-25F on one end, and a DB-9F on the other end. Obviously, only nine wires are connected and a null-modem adapter is still required.

At this point it's a good idea to discuss the wires required by Cheap Link. Without getting into the details of how an RS-232 interface works, there are many wires normally used for data transmission and control. However, Cheap Link uses only three wires: "transmit," "receive," and "ground."

The trick to wiring a null-modem cable or adapter is to know which pin is for transmitting, which is for receiving, and which one is ground. When a DB-25 connector (regardless of gender) is used, the standard convention is to use pin 2 to transmit data, pin 3 to receive data, and pin 7 as the signal ground. With a DB-9 (again ignoring gender), pin 2 is receive, pin 3 is transmit, and pin 5 is ground. Don't ask me why they both don't use the same pin designations—they easily could have, but they don't!

Regardless of both gender and the number of pins, the transmit pin from one computer must be connected to the receive pin of the other computer, and vice versa. If you don't swap the

transmit and receive connections, both computers will try using the same wire to transmit data, and they both will try to receive from the same wire. If you stop to think about it, that can't possibly work. That's where a null-modem adapter or cable comes in—it swaps the wires so the transmissions of one computer are received by the other, and vice versa.

Normally, a null-modem adapter has a male connector at one end and a female at the other, so gender is not effected, and it is bi-directional. If you buy a null-modem adapter, just stick it in line with the serial cable and that takes care of your hardware.

DB-25 null-modem adapters are very common, and sell for $2–$7. You may have difficulty finding a DB-9 null-modem adapter. If this is the case, get one or two DB-9/DB-25 cables as needed and a DB-25 null-modem adapter.

You can save almost the entire cost of cables and adapters by making your own custom cable that does two things: mates with the serial connectors for machines A and B, and uses three wires to carry transmit, receive and ground in the null-modem configuration. Figures 2A, 2B, and 2C show you the typical

configurations. Note that the connector on one end is male or female, depending on whether you are making a null-modem cable or a gender-preserving adapter.

Incidentally, you can buy so-called null-modem cables, but be careful! In my experience, since they look exactly like regular cables, they may be mislabelled and not actually swap the transmit and receive wires (as well as various other differences provided by some null-modem hardware). My suggestion, if you don't make your own cables, is to use a straight-through cable and a null-modem adapter, or check the connector-to-connector pin wiring with an ohmmeter before buying a so-called null-modem cable.

Sometimes, especially on laptops and portables, space considerations have forced the manufacturer to use a special socket. If this is the case, you may have to obtain the mating connector from the manufacturer, or use a cable they supply.

Cheap Software. In researching this article, I tried at least a dozen different programs to transfer files. Some were

CHEAP LINK

regular communication programs, but they were either too complicated, too slow, or, more commonly, both.

Several were shareware programs available from bulletin boards and public domain vendors. Of those I tried, I was shocked at the complexity and poor documentation of some of them. One had great documentation, but I couldn't get the program to work. Another required special drivers and modification of your CONFIG.SYS file.

I only found one free public-domain program from such sources that worked at high speed and was relatively easy to use. However, the documentation was outdated and incorrect for the version, and I had to do considerable head-scratching to make it work. Then I found it only transferred a single file at a time, and had to be reloaded on both computers for each file. That made it unacceptable to me.

I was close to giving up when I contacted Bob Jack, who wrote my favorite telecommunications program, OPUS 6/7 (Sanyo MBC-55X) and OPUS 8 (IBM PC). Because of its simplicity, I had pretty much decided to recommend OPUS 8 for this article even though it was limited to modem speeds.

But Bob told me he no longer sold OPUS 8. However, when I explained my frustration with finding a simple transfer program, Bob told me about a program he wrote a couple of years ago. It was designed exclusively for file transfer, using its own proprietary protocol, and would not support modem use. When he told me he sold it for under $20, I had him send me a copy.

This program, called by the unlikely name of Saffron, is heads and shoulders above all the others I tried. It is incredibly easy to use, and transfers any file (program or data) at 115,200 baud (about 15,000 characters per second).

Furthermore, Saffron allows you to have either machine act as the "master" or "slave" at any time. You can perform the various file-management functions on any drive on either machine from either machine—all at blinding speed.

Saffron version 3.0's documentation (on the disk) is only 15 sheets, many of them partly blank, and the program is so intuitive that you probably won't need the documentation after brief familiarization with Saffron's capabilities.

There is only one program file (instead of the half-dozen or more with most other programs I tried), and no installation is required.

I tested Saffron on all possible matings of my four PC-compatible machines (PC/AT, PC/XT, Toshiba T1000 laptop, Microgold Voyager 286/12 laptop) using three-wire cables. On the T1000 I had to use its Chad program with color-on-color mode 2 to see the reverse-video highlighted selections. Except for having to set a sync bit (a program option) at 15,200 bps for a slow 4.77MHz XT, Saffron worked with all its default settings. For this application, the program is a winner!

Saffron is available only directly from Bob Jack Software, 8371 White Road, Burbank, OH 44214. Phone: 216-948-2059. It is supplied on a 360K, 5.25-inch diskette for $19.95, postpaid. Add $2 for both a 5.25-inch and a 720K 3.5-inch microdiskette. (Ohio residents add local sales tax.)

Other programs may require a full null-modem adapter or cable with more than three wires. If you follow the steps we've laid out for determining what you need, you should have no problem setting up your own PC-to-PC file-transfer system. ∎