New models of PCs, laptops, notebooks and sub-notebooks are coming out fast and furious. Manufacturers are making sure that each new model is not only smaller, lighter and more powerful but also equipped with unique features which will differentiate it from the pack.

With the current price war still raging, price differences between branded PCs will soon narrow to between $200 to $300 per unit according to Research Asia. With a given price range, customers will be looking for specific features to suit their needs.

One feature which the latest models are adopting is the Personal Computers Memory Card International Association (PCMCIA) interface which is the I/O standard for all portable computing peripherals including fax/modem cards, LAN adapters, hard disk drives and memory storage. These capabilities, in the form of personal computer cards (PC Cards), are a convenient alternative to pocket adapters and docking stations. It provides customers the flexibility of adding the necessary features after the base system has been purchased.

IBM's recently announced PS/2E which has a flat display panel boasts of four PCMCIA slots which allow the full range of RAM card, modem cards and 1.8" disk drives to be incorporated at the same time.

**Terminology**

PCMCIA connectors from FCI Electronics can be broadly divided into three distinct modules - header, eject mechanism and receptacle. Figure I shows the various modules.

The header module consists of a plastic housing with two mounting holes for it to be screwed on to the printed circuit board (PCB). Pins come out of both ends of the housing. The pins from the front end of the housing are also called solder tails simply because they are ultimately soldered to the PCB. Mating pins coming out of the back of the housing are standard 68 positions (2x34) per PCMCIA. These pins mate with the PC Cards when slotted in.
The eject mechanism module is an option which allows the PC Card to be ejected by depressing a push button instead of having to manually pull out the PC Card. Without this, the header comes with guide rails and this is offered as a complete system by itself known as a "non-eject header" module. The eject mechanism comes as a separate subsystem which is mounted to the header in a secondary operation after soldering.

The receptacle forms part of the PC Card. It has two portions, the front being the 68 sockets mating with the 68 pins from the header. The back pins, also called solder tails, are ultimately soldered to the PCB of the PC Card.

Figure 1: PCMCIA CONNECTORS TERMINOLOGY

Modular Design: For Flexibility

FCI Electronics (formerly DuPont Connector Systems) invented the pin and socket memory card in 1984. This originated from a need to provide a user-installable package containing several memory ICs. At the same time, a connector system was developed which would be rugged (capable of a high number of insertion and withdrawal cycles) and flexible (capable of matching the various customer constraints of PCB real estate, laptop height limits and component placements).

Today, FCI Electronics' best seller eject header can accept PCMCIA Types I, II and III Cards corresponding to height formats of 3.3mm, 5.0mm and 10.5mm respectively.

For the header module, the plastic housing remains the same for various solder tail configurations meeting specific customer needs for surface mount (SMT) and through-hole applications. Stacking the header modules allows a double deck solution which offer space saving benefits and can accommodate three PC Card options: two Type I cards or one Type I card and one Type II card or one Type III card.

The header modules come with standard side latches which can accommodate various eject mechanisms. Eject mechanism modules come in the form of front eject systems or side eject systems. For each of these systems, the push rod position
includes left or right hand versions for single-decks. For double-deck options, the combination includes top and bottom deck push rods both on the right or on the left or top right bottom left and vice versa. Putting the push rods on the right or left side depends on the position of the PCMCIA slot on the PC. Some PC designer feel that having the push rod on different sides of a double-deck version allows the user to eject the top PC Card without accidentally ejecting the bottom. Push rods being part of the external features of the PC casing can also come in various colors and lengths to match the designer's preference. For example, IBM specifies blue push rods.

Additional features available include mechanical locking of the push rod to prevent accidental ejection of the PC Card, and autolocking (via software password) to prevent theft of the cards.

The receptacle module on the PC Card side comes in two options - stress relief slots for Card PCB or with customized side ears for mounting to the Card frame or cover plate. The solder tails come in only SMT format with straddle mount (interconnected to both side of the PCB), or single side attachment for centered PCB or offset PCB to accommodate larger ASIC packages.

FCI's modular design allows the systems manufacturer the distinct advantage of assembling in volume the various combinations of standard modules thereby providing a means for minimizing part numbers and controlling of inventory costs without the stocking of special connectors.

**Modular Design: For Manufacturability**

To meet short leadtimes for prototypes and quick ramp-ups for volume production and to accommodate the various constraints and preferences specified by each customer, the FCI Electronics product development team incorporated Design for Manufacturability (DFM) techniques at the front end of the design work. This has allowed the company to be fast and responsive to customers where quick time to market is survival. Internally, the company is able to avoid high investment costs in new toolings where the product design allows modifications to existing toolings to accommodate special features.

Beginning with the header housing which is standardized to a fixed high temperature plastic, this allows the molding process to be fully characterized to facilitate predictable results when modifications to the mold is made. The housing mold is designed such that soft toolings allow various standoff heights to be molded, Standoffs allow the space beneath the connector to be used for component placement. Alternatively, standoffs can be achieved by adding molded inserts to the housing base.

Setup time for switching of the various solder tail configurations is also minimized due to a fixed header housing design. The stitching machines are programmable for various pin lengths and only the tooling is changed for various solder tail configurations.

For the eject mechanism, the cover plate, eject plate, link arms and ESD grounding clips are all standard designs. The product is designed such that only the guide rails
and the push rods need to be modified to accommodate the various customer needs. The push rod mold allows soft toolings for various lengths. Except for the rivet to hold the link arm to the cover plate, all the rest of the components can be easily assembled with simple but clever catches in place.

**Competitive Advantage**

With the broadest range of PCMCIA connectors which are designed with flexibility and manufacturability at the onset, FCI Electronics is able to capture the largest market share as indicated by the Fleck Report.

**F T Liu** is product manager for FCI Electronics (Singapore). He holds a B Eng (Hons) from Nanyang Technological University in Singapore.