



Synaptics[®]
The Human Interface Company[™]

PRODUCT SPECIFICATION

Synaptics TouchPad
Model, COMBO
TM41B-200

P/N 510-000055, Rev B

REV	ECO	Description	Rel. Date	Originator
A	10390	Initial Release	8/3/99	Fred Caldwell
B		Drawing update (3/3/2000)		Fred Caldwell

Synaptics TouchPad Module

Model TM41B-200

General Description

Note: This specification supersedes all previous specifications for the TM41B-200.

The Synaptics TouchPad, a pointing device for personal computers, detects the position of a finger over a touch-sensitive area. To move the cursor, the user lightly slides a finger over the smooth sensor area. To 'click', the user gently taps on the surface.

For integrated pointing device applications, the Synaptics TouchPad is the industry standard. Key advantages which has made it the market-leader include low profile, high reliability, and low power consumption.

The Synaptics TouchPad is a capacitive sensor -- the finger is detected by measuring its effect on an array of capacitive lines integrated into the PC board. The pad senses both the finger's position and its contact area (X, Y, and Z). The area of contact is a measure of applied pressure.

One side of the module PC board is the sensor surface; electronic components are mounted on the other side. The sensitive area is protected by a layer of smooth and durable mylar. The mylar covering can be screen-printed in any color or pattern at the customer's request.

The Synaptics TouchPad communicates with the host via a standard RS-232 serial interface or via a standard PS/2 interface with the use of an adapter. The TM41B-200 is fully compatible with the standard Microsoft mouse driver, although several enhancements are available with the Windows 95, Windows 98 and Windows NT drivers that make the TouchPad more than just a pointing device.

For the standard RS-232 interface, the module connector includes the signal wires RxD, TxD, RTS, and DTR, plus GND and two connections for external mouse-button switches. The RTS and DTR signals are used to generate the high power supply and the RxD signal is used to generate the low power supply for transmission.

With the use of an adapter, a standard PS/2 interface can be obtained. The PS/2 interface includes the PS/2 signal pins, power supply pins and two connections for external button switches. Switches are not included with the module.

The Synaptics TouchPad includes a special "Edge Motion" feature that allows the user to extend a drag operation when the finger reaches the edge of the sensor pad. The cursor continues to coast in the indicated direction when the finger is held against the edge.

In addition to the Edge-Motion feature, with the Windows 95 and Windows NT Drivers and Enhancements the user can:

- Scroll through documents without using the scrollbar with *Virtual Scroll Bars*
- Control edge-motion speed with slight changes in finger pressure
- Keep the cursor in the active window with *Edge Finder*
- Watch finger movement and pressure with *Mood Pad* and *Pressure Graph*
- Adjust touch sensitivity from light to heavy
- Disable or enable individual tap gestures for left-button click and drag
- Turn drag-lock on or off
- Turn Edge Motion on or off
- Select 2 or 3 button mode
- Use *High Report Rate* for smoother motion.

PRODUCT FEATURES

- Accurate positioning
 - Low fatigue pointing action
 - Low profile
 - No moving parts, high reliability
 - Low power consumption
 - Environmentally sealed
 - Compact size
 - Software configurable
 - Low weight
- Advanced Gestures
 - Tap - emulates a mouse “click”
 - Double Tap - emulates a mouse “double click”
 - Tap & Drag - emulates a “click and drag” of a mouse

ENVIRONMENTAL SPECIFICATIONS

Operating temperature:	0°C to 50°C
Operating humidity:	5% - 95% relative humidity, non-condensing
Storage temperature:	-40°C to +65°C
ESD:	±15 kV applied to front surface See ESD Testing Specification PN 520-000270-01.

For more details see Environmental Testing Specification PN 520-000271-01.

ELECTRICAL SPECIFICATIONS

For RS-232 operation (all signals follow RS-232 specification, EIA-232D)

Power supply voltage:	Positive: +6V to +15V supplied by RTS and DTR @ 3.5mA per channel Negative: -6V to -15V supplied by RxD
Source impedance of the RTS and DTR drivers:	min 150Ω, max 300Ω
Power supply current:	5mA nominal at ± 6V power supply voltage 24mA nominal at ± 12V power supply voltage

For PS/2 operation:

Power supply voltage:	5.0 Volt ± 10%
Power supply current:	5mA nominal operating
Power supply rise time:	0V to 4.5V in 20ms maximum (power supply voltage must be strictly monotonically increasing to 4.5V and remain at or above this value)

For more details see Electrical Testing Specification PN 520-000273-01.

OPERATING SPECIFICATIONS

X/Y position resolution:	1000 points/inch (40 points/mm) (graphics tablet mode)
Interface:	RS-232 - serial or PS/2 (with adapter)

PHYSICAL SPECIFICATIONS

See next page for detailed drawing

Thickness	2.0 mm PCB thickness (including mylar cover) 5.00 mm max. PCB at highest component
Width	64.8 mm ± 0.2mm 62.5 mm maximum bezel opening
Height	48.8 mm ± 0.2mm 46.5 mm maximum bezel opening
Weight	14.5 g ± 1 g

COLOR INFORMATION

Standard Color: Standard Synaptics colors. Ask your sales engineer for a sample.

PS/2 is a registered trademark of IBM Corp. Microsoft is a registered trademark of Microsoft Corp.

Physical Dimensions

Figure 1: Sensor (Top) View

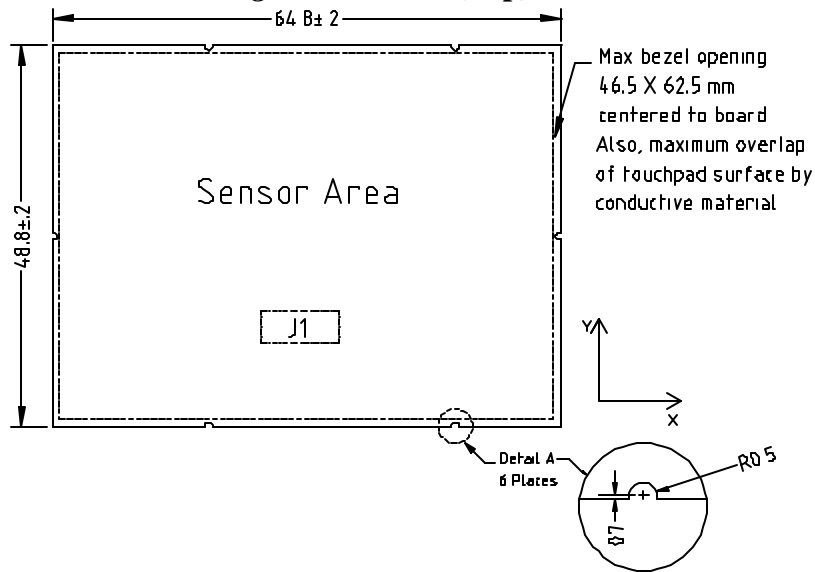


Figure 2: Side View

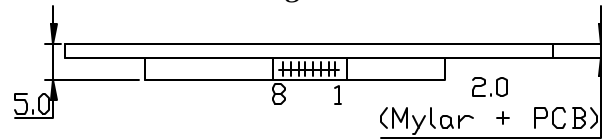
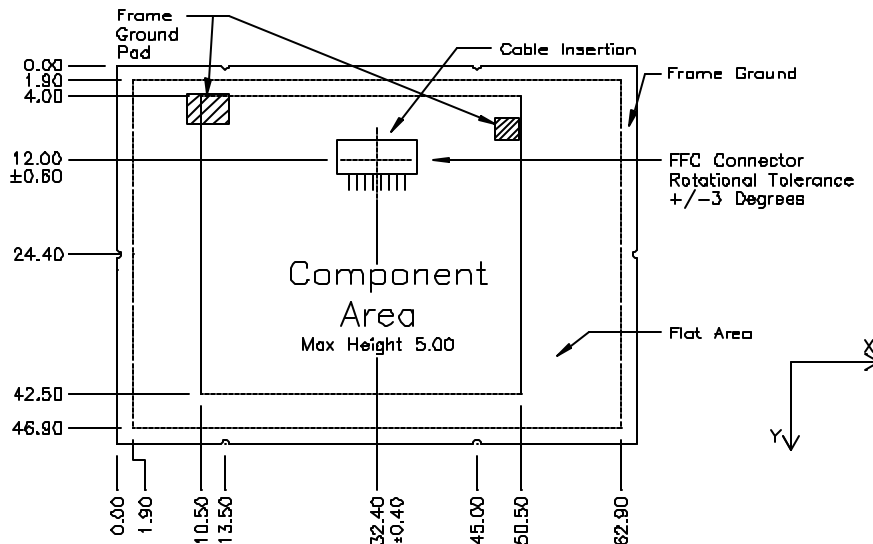


Figure 3: Component (Bottom) View



Note: All dimensions are in millimeters. Unless noted, all dimensional tolerances are ± 0.15 mm.

In order to keep the lowest possible cost, Synaptics reserves the right to use components from various approved vendors, and will guarantee all height restrictions of the component area are maintained. Therefore, designs should be held within the above physical dimensions. For mechanical samples, please contact Synaptics.

Connector Information

Figure 4: Module Connector J1 (Reference Drawing)

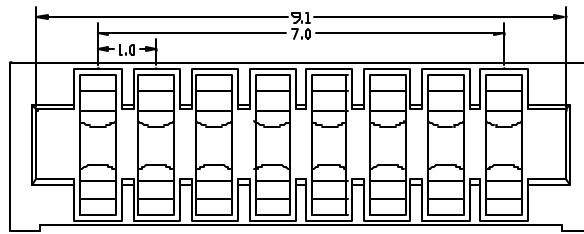


Figure 5: Dimensions of FFC Cable

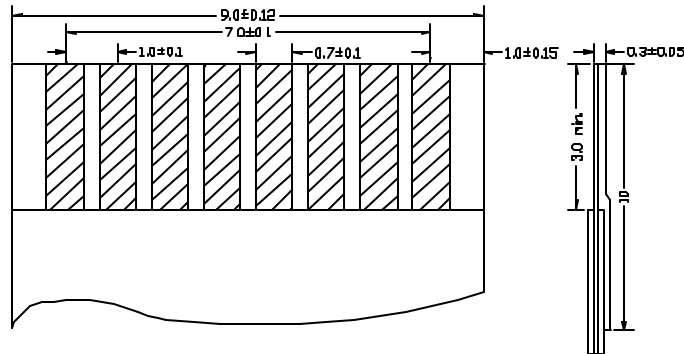


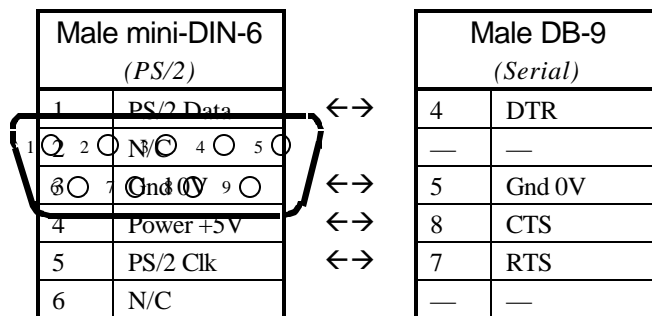
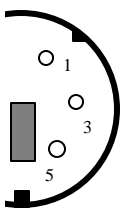
Table 1: Combo-Module - Pin Out of Connector J1

1	2	3	4	5	6	7	8
DTR/DSR ¹	TxD	RxD	Right Switch	Left Switch	GND (OV)	CTS Vdd	RTS PS/2 Clock
PS/2 Data	NC	NC					

Connector Type: Elco Model # 04-6227-008-100-800 or equivalent. Mating connector not included in module.
 Note: All dimensions are in mm (millimeters). Unless noted all dimensional tolerances are ± 0.15 mm.

Adapter Connections²

Figure 6: Serial to PS/2 Adapter (Internal Connections)



The adapter may consist of a short (< 5cm) four-conductor cable with a male mini-DIN-6 connector on one end, and a male DB-9 connector on the other. Alternatively, the adapter can be a molded plastic block with the two connectors embedded in either end. There are only four (4) connections between the pins of the two connectors, as shown by the arrows (↔) in Figure 6. The details of the physical design and construction of the adapter are left to the discretion of the OEM product designer.

¹ To support plug-and-play, DTR and DSR should be wired together.

² Serial to PS/2 adapter connectors are not provided.

Module Orientation

Figure 7: Model # TM41BU-200 (UP)

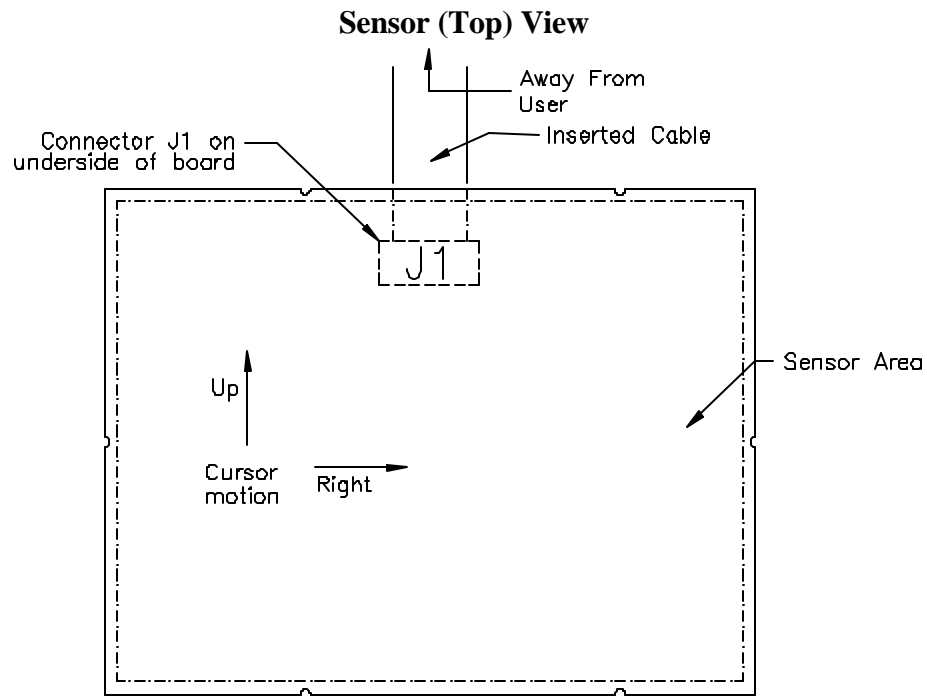
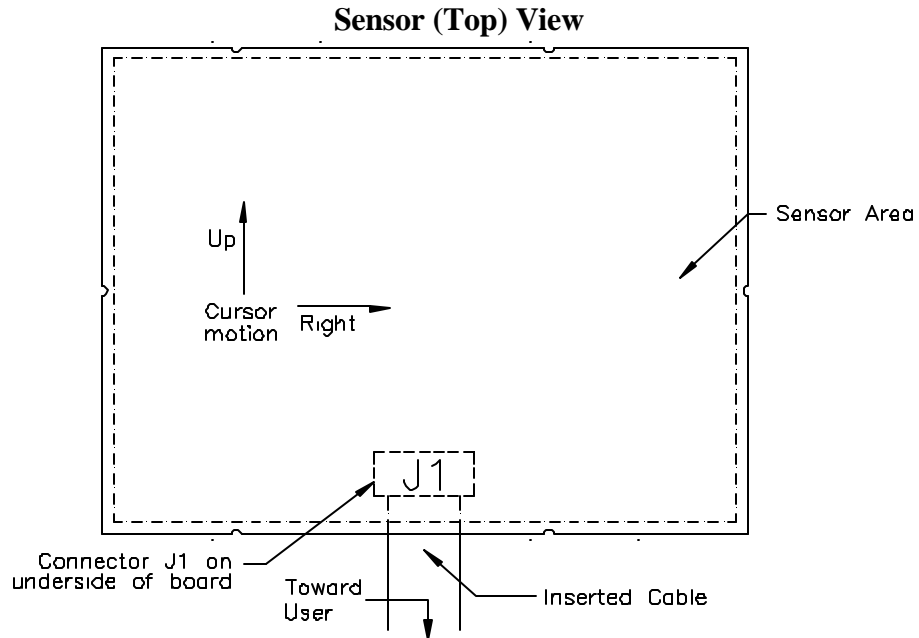


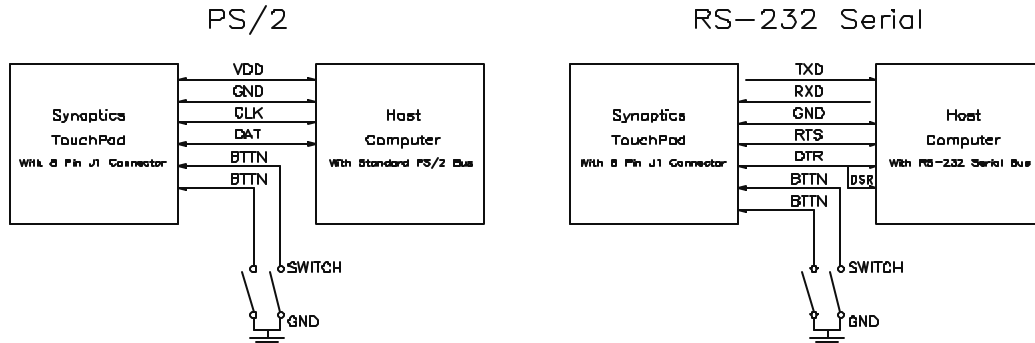
Figure 8: Model # TM41BD-200 (DOWN)



Note: Arrow indicates direction of finger movement for cursor to move up.

Interface Information

**Figure 9: PS/2 & RS-232 Serial Interfaces
System Connection**



Mounting Considerations

Button Shape and Placement

Synaptics TouchPads offer full electrical and software support for button switches. The shape and placement of the physical buttons is left up to the case designer.

Our tap and drag gestures, together with our unique edge motion feature, eliminate most of the button operations for experienced users. This allows the buttons to be relatively small. However, the buttons should still be sturdy and intuitively placed. In most cases, buttons which are wide but not very tall and placed below the TouchPad will give satisfactory performance.

Bezel Shape and Alignment

The shape and alignment of the bezel are critical to the performance of the TouchPad because they provide tactile feedback to users when they have reached the edge of the pad. When using a TouchPad, the operator will naturally be looking at the computer screen and not at his or her hands. Tactile feedback is needed to prevent the user's finger from moving outside the TouchPad's active area.

To provide precise feedback, while still being comfortable to use, we recommend that the bezel be at least 1.5mm high, and that it have rounded or steeply tapered edges. Gradually tapered edges encourage the user to slide his finger up into the

bezel when he reaches the edge of the pad. This can result in unsatisfactory performance.

For our edge motion feature to operate properly, the opening in the bezel should be carefully centered over the TouchPad and should permit the center of the finger to move well past the edge motion threshold. Pay special attention to the bezel size notes in Figure 1.

TouchPad Mounting

The TouchPad should be firmly supported from below. This will keep the TouchPad from moving with heavy finger tapping.

Figure 3 shows the flat areas and the frame ground area on our TouchPads. The flat areas will remain free of components in future versions of the PC board. All insulated clips, brackets, or posts used to support the PC board should make contact within the flat areas.

Metallic or otherwise conductive brackets or materials should only make contact with the PC board within the frame ground. The frame ground ring is shorted to ground. Do not place conductors near the circuit traces on the component side of the TouchPad. Conductive material should never be closer than 1 mm to any components or the PCB in the Component or Flat Areas.