KEYBOARD SPECIFICATION

TO :

PRODUCT MODEL : KEYBOARD

CUSTOMER MODEL : SEM-DTLD

SAMSUNG ELECTRO-MECHANICS CO,Ltd.
314, Maetan-3 Dong, Paldal-Gu, Suwon, Kyungki-Do, Korea

Tel : +82-331-210-6350, 5381
Fax : +82-331-210-5226

CODE	SEM-DTLD	APPROVALS	DATE
REVISION	KS7-01-0	DRAWN	
SIZE	A4	CHECKED	
SCALE	1.0	ISSUED	

F C C N O T I C E

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the instructions listed in this user's manual, may cause interference to radio and television reception.

It has been tested and found to comply with the limits for a CLASS B computing device in accordance with the specifications in SUB PART B of part 15 of the FCC rules, which are designed to provide reasonable protection against such interference in a residential installation. if this equipment does cause interference to radio or television reception, which can be determined by turning off the equipment, and seeing if the interference stops, the user is encouraged to try and correct the interference by one or more of the following measures :

1. Reorient the receiving antenna.

2. Relocate the computer with respect to the radio or television.

3. Move the computer further away from the radio or television.

4. Plug the computer into a different outlet so the computer and television are on different circuits.

NOTE : This unit was tested with shielded cables on the peripheral devices. Shielded cables must be used with the unit to insure compliance.

NOTE : The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment, such modifications could void the user's authority to operate the equipment.

1. PRODUCT OVERVIEW

This specification defines the mechanical, electrical, and functional specifications of the SAMSUNG Electro-Mechanics 106 keys Korean version Windows 95 compatible keyboard. It also defines the operational characteristics, environmental specification, compliance certifications, ergonomic considerations, and testability requirements of this keyboard. This keyboard is a low profile, 106 keys, detachable unit, with three additional keys specific to Windows 95. All keys generate a unique output code upon depression and a similar but unique output code upon switch release. The communication with the host system is a via a bi-directional serial link using AT protocol. The key top layout, switch coding, serial communication and functionality is compatible with the IBM AT enhanced keyboard, especially under the Novell (non dedicated), XENIX, UNIX, and OS/2 operating environments.

2. FUNCTIONAL DESCRIPTIONS

2.1 KEYBOARD SCAN CODES

This keyboard contains 3 scan code sets. The system defaults to scan set2. but can be switched to set 1 or set 3. If the keyboard is using communication mode 1 protocol, only scan code set 1 can be used. Tables 1, 2, and 3 list the key numbers and three scan codes sets in hexadecimal values. All the keys are typematic except for the Pause key. When a key is pressed down, the make scan code is sent to the system. When the key is released, its break code is sent. If two or more keys are held down, only the last key pressed repeats at the typematic rate. Typematic 0peration stops when the last pressed key is released. even if other keys are being released or some other keys are still held down. Scan code set 3 is programmable by the user. Programmed key(s) does not change when switching between scan code sets.

2.2 PROTOCOL

This keyboard communicates with the system in AT protocol only. XT protocol is not supported.

2.2.1 COMMUNICATION MODE(AT)

Data Format 11bits(positive logic)

0	X	X	X	X	X	X	X	X	P	1
start	B0	B1	B2	B3	B4	B5	B6	B7	Parity	stop
(LSB)									(ODD)	

in idle state, the clock and data lines are in the high state.

Keyboard Data Output - When the keyboard is ready to send data to system, it first checks clock and data lines. If either one is in the inactive state, data is stored in the keyboard buffer. If both are in the active state. keyboard sends start bit, 8 data bits, the parity bit, and the stop bit. Data will be valid before the trailing edge and after the leading edge of the clock pulse. During the transmission the keyboard checks the clock line at least every 60 microseconds. If the system lowers the clock

line before the leading edge of the 10th clock, the keyboard stops sending, then buffers the data and returns clock and data lines to high state.

Keyboard Data Input - When the system is ready to send data to keyboard, it first checks clock line to see if keyboard is sending data. If keyboard is not sending data or it is sending data but has not reached the 10th clock, the system can inhibit the interface by forcing the clock line low for more than 60 microseconds and prepares to send data

This keyboard checks clock line status at least every 3 milliseconds. If a system Request To Send (RTS) is detected, the keyboard clocks 11bits in. After the 10th bit, the keyboard checks for a high state in data line then pulls it low and clocks one more bit to signal the system that data has been received. If data is low after the 10 th bit, it indicates a frame error. The keyboard continues to count until data line goes high, then pulls it low and issues a RESEND to the system. The keyboard is allowed 3 milliseconds to respond to any command except RESET.

2.2.2 COMMANDS FROM THE SYSTEM

The system can send commands to the keyboard at any time. The keyboard needs to respond within 3 milliseconds, unless the system prevents keyboard output, when doing self test, or executing a RESET.

The followings are the keyboard input commands and the actions that keyboard needs to take.

SET/RESET STATUS INDICATOR (HEX ED)
- Responds with ACK.
- Receives option byte (or another command)
- Responds with ACK.
- Updates status indicators*.
  B0=1 -> SCROLL LOCK INDICATOR is turned on.
  B1=1 -> NUM LOCK INDICATOR is turned on.
  B2=1 -> CAPS LOCK INDICATOR is turned on.
  B3-B7-> RESERVED (MUST BE 0).
- Returns to previous scanning state.

* Scroll Lock, Num Lock, and Caps Lock indicators are driven by the host system.

ECHO (HEX EE)
- Responds with EE hex.
- Returns to previous scanning state.

INVALID COMMANDS (HEX EF AND F1)
- Returns a RESEND command.
- Returns to previous scanning state.

SELECT ALTERNATE SCAN CODES (HEX F0)
- Responds with ACK.
- Clears out buffer.
- Sets typematic rate/delay.
- Clears last typematic key.
- Receives option byte.
- Responds with ACK
- Option byte = 00 -> responds ACK, then returns scan code set number
  01 -> selects scan code set 1
  02 -> selects scan code set 2
  03 -> selects scan code set 3
- Returns to previous scanning rate.

READ ID (HEX F2)
- Responds with ACK.
- Discontinues scanning.
- Sends two ID bytes. The second byte will be sent within 500ms after first byte.
- Returns scanning.

SET TYPEMATIC RATE/DELAY(HEX F3)
- Responds with ACK.
- Receives rate/delay value(or another command).
- Responds with ACK.
- Sets rate/delay.
  Repeat period=(8+A)*(2^B)*0.00417 seconds
  A = binary value of bits 2, 1, and 0
  B = binary value of bits 4 and 3
  Delay = (C+1)*250 milliseconds
  C = binary value of bits 6 and 5. Bit 7 is always 0
  Default rate = 10.9 chars/sec + 20 %
  Default delay = 500 ms +/- 20 %
- Returns to previous scanning state.

ENABLE (HEX F4)
- Responds with ACK.
- Clears output buffer.
- Clears last typematic key.
- Starts scanning.

DEFAULT DISABLE (HEX F5)
- Responds with ACK.
- Resets all conditions to power-on state.
- Clears out buffer.
- Sets the default key type (scan code set 3 only).
- Sets typematic rate/delay.
- Clears last typematic key.

SET DEFAULT (HEX F6)
- Responds with ACK.
- Resets all conditions to power-on state.
- Clears out buffer.
- Sets the default key type(scan code set 3 only).
- Sets typematic rate/delay.
- Clears last typematic key.
- Continues scanning.

SET ALL KEYS (HEX F7,F8,F9,FA)
- Responds with ACK.
- Clears out buffer.
- Sets all key type(affect only scan code set 3 operation)
  F7 -> Typematic
  F8 -> Make/Break
  F9 -> Make
  FA -> Typematic/Make/Break
- Returns to previous scanning rate.

SET KEYTYPE(HEX FB,FC,FD)
- Responds with ACK.
- Clears out buffer.
- Receives key ID byte.
- Responds with ACK.
- Sets key ID type (affect only scan code set 3 operation).
  FB -> Typematic
  FC -> make/Break
  FD -> Make
- Returns to previous scanning state.

RESEND (HEX FE)
- Sends the previous output again. If the previous byte is RESEND, the last byte before RESEND will be sent.

RESET (HEX FF)
- Responds with ACK.
- Checks clock and data lines in the high state for at least 500 microseconds or receives another command.

2.2.3 COMMANDS TO THE SYSTEM

The following are the keyboard output commands.

ACKNOWLEDGE (HEX FA)
The keyboard sends an acknowledge in response to any valid command from the system except for RESEND and ECHO.

BAT COMPLETION CODE (HEX AA)
This command is issued after successful completion of keyboard self test.

BAT FAILURE CODE (HEX FC)
If a BAT failure occurs, the keyboard sends this code, discontinues scanning, and waits for a system response or reset.

ECHO (HEX EE)
The keyboard sends this code in response to an ECHO command.

KEYBOARD ID (HEX 83AB)
The 2 byte ID is issued to response to READ ID command. The low byte is sent first followed by the high byte.

KEYBOARD BUFFER OVERRUN (HEX 00 or FF)
If keyboard buffer overflows, the overrun code will replace the last byte in the buffer. If the keyboard is using scan code set1, the code is hex FF. For sets2 and 3, the code is hex00.

RESEND (HEX FE)
When the keyboard receives an invalid input or any input with incorrect parity, the RESEND command is sent.

2.3 KEY ROLLOVER

This keyboard is adopting M-key rollover.

2.4 KEYBOARD BUFFER

This keyboard will buffer 16 bytes in a first-in-first-out order when the system is able to receive scan codes from the keyboard. The response codes and repeated codes will not be buffered.

If keystrokes generate a multiple-byte sequence, the entire sequence must fit into the buffer or the keystroke is discarded and a buffer-overrun condition occurs.

2.5 POWER-ON RESET AND SELF-TEST

This keyboard contains reset circuitry. The duration of the keyboard POWER-ON-RESET (POR) is within 150 milliseconds to 2.0 seconds after the power is applied to the keyboard.

After executing POR, the keyboard executes a self test. The self test includes a processor test, a checksum of the ROM, and a RAM test. The LEDs are turned on at the beginning and off at the end of the self test. The self test takes a minimum 300 milliseconds and a maximum 500 milliseconds.
If the self test is successful, a completion code AA hex is sent to the system and the keyboard starts scanning. If the self test fails, and error code is sent, the keyboard is

disabled and waits for a command from the system. The completion codes are sent between 450 milliseconds and 2.5 seconds after POR, and between 300 and 500 milliseconds after a RESET command is acknowledged.

2.6 HOT PLUG CAPABILITY

This keyboard is designed to allow plugging and unplugging into a host system while the host system is under power. This action does not cause any destructive effects on the host system or keyboard. The keyboard then continues normal operation as if a power on reset condition occurred.

The interface consists of two bi-directional lines, clock and data lines, which can be controlled by TTL open collector drives on either side. The typical interface circuit consists of a 2K ohm pull-up resistor.

2.7 CIRCUIT DIAGRAM

See Appendix A-1.

2.9 PART LIST

See Appendix A-2.

2.8 MATRIX

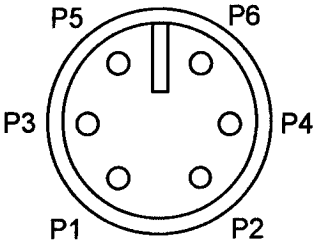
See Appendix A-3

3. CONNECTION

3.1 SIGNAL CONNECTOR

The connector is a six pin Mini-Din connector (below)

Pin No	Signal	Line color
P1	Data	Yellow
P2	N.C	-
P3	Ground	Black
P4	+5VDC	Red
P5	Clock	Blue
P6	N.C.	-
Shield	-	Black



3.2 POWER REQUIREMENTS

Input Voltage = 5V ±5%
Input Current = 200mA max

4. MECHANICAL DESCRIPTIONS

4.1 KEYBOARD LAYOUT, LEGENDS AND COLORS

See Figure 4-1 for layout and legends.
See Figure 4-4 for colors.
Detailed key layout and characters is in Appendix A-5

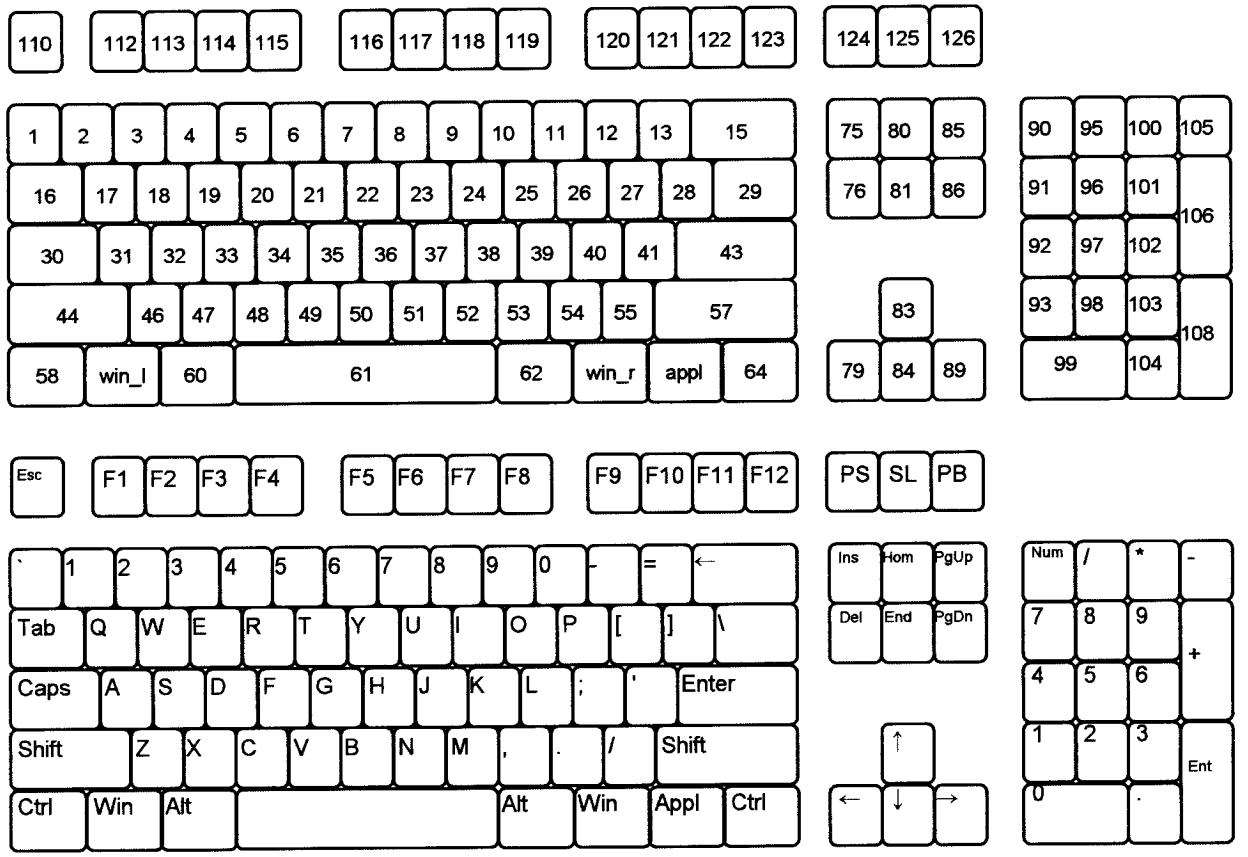


Figure 4-1 Keyboard Layout.

4.2 KEYBOARD CABLE

See Figure 4-2 for cable length.

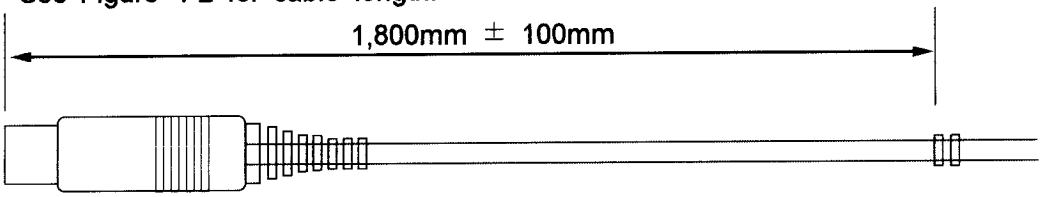


Figure 4-2 Keyboard Cable Length