TouchInternational
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Setup and Users Manual

Analog Resistive Touch Screen Controller
48-B-5-04

1. Product Overview
1-1. Products Applicable
This specification is applicable to 48-B-5-04 and 48-B-5-05.

1-2. Product Names

Product Name	Description
48-B-5-04	RS232 installed touch screen controller board.
48-B-5-05	RS232 installed touch screen controller board with EEPROM.

1-3. Overview
48-B-5-04 and 48-B-5-05 are touch screen controller boards that performs an A/D conversion of an analog signal of a 5 wire resistive touch screen, and transmits the coordinate data to the host in a 10-bit resolution serial correspondence at 9600bps. 48-B-5-04 and 48-B-5-05 can be used for various applications for its functions including the power saving mode, seven sampling speed settings (max. 150p/s *1), two external switch connections, and automatic calibration data loading with an external EEPROM.

§   48-B-5-04   48-B-5-04 dispenses a need to newly design the peripheral circuits, and can easily be used by connecting to the touch screen and the host. Using the driver software *2 enables the mouse emulation on various operation systems and dispenses the need to newly design the controller software.

§   48-B-5-05   An EEPROM installed version of 48-B-5-04. The calibration data can be stored in the EEPROM and automatically read after power-on.

*1: 150 transmissions of coordinate data per second.
*2: Please contact the local sales representatives for software availability.

2. Specifications

General Specifications

Item		Rating	Remarks
Operating Temp.	48-B-5-04	-20°C to +75°C (No dew condensation)	
	48-B-5-05		
Storing Temp.	48-B-5-04	-20°C to +85°C (No dew condensation)	
	48-B-5-05		
Supply Voltage	48-B-5-04	DC 4.1V to 5.5V	
	48-B-5-05		
Supply Current	48-B-5-04	40mA	Vin=5.0V, At sampling Rate = 50p/s when touch screen is activated
	48-B-5-05		
Correspondence	Format	Asynchronous Serial	Fixed value
	Transfer Rate	9600bps	
	Data Format	8bit	
	Stop Bit	1bit	
	Parity	None	
Frequency		6MHz	6MHz fixed
Dimension	48-B-5-04	30 x 40 mm	
	48-B-5-05		
Max height of components		5.5mm	
		(2mm)	When EEPROM mounted. The backside of a board.

Performance Specifications

Description	Rating	Note
Coordinate Output Rate (point/sec)	(1) point mode (2) 30p/s (3) 50p/s (4) 80p/s (5) 100p/s (6) 130p/s (7) 150p/s	Default: 50pps with TOUCH INTERNATIONAL original driver software.
Coordinate Resolution	10bit (1024 x 1024)	The value will be lower in the active area of the touch screen
Linearity Error	±3 LSB	
Input Response Time	23ms	Maximum value at 50pps. When using the coordinate data mode

3. Connector
3-1. Explanation of a connector terminal

CN	Terminal	Name	Function
CN1	1	XL/UR	Touch screen Input XL/UR (Open if CN2 is used)
	2	XR/LR	Touch screen Input XR/LR (Open if CN2 is used)
	3	Sense	Coordinates detection (Open if CN2 is used)
	4	YU/UL	Touch screen Input YU/UL (Open if CN2 is used)
	5	YD/LL	Touch screen Input YD/LL (Open if CN2 is used)
CN2	1	YD/LL	Touch screen Input YD/LL (Open if CN1 is used)
	2	YU/UL	Touch screen Input YU/UL (Open if CN1 is used)
	3	Sense	Coordinates detection (Open if CN2 is used)
	4	XR/LR	Touch screen Input XR/LR (Open if CN1 is used)
	5	XL/UR	Touch screen Input XL/UR (Open if CN1 is used)
CN3	1	Dout	RS-232C Data Output
	2	Din	RS-232C Data Input
	3	GND	RS-232C GND
CN4	1	Dout	RS-232C Data Output
	2	Din	RS-232C Data Input
	3	GND	RS-232C GND
CN5	1	Vin	Power Input
	2	GND	GND

Either CN1 or CN2 is mounted.

Either CN3 or CN4 is mounted.

3-2. The mounted connector

CN	P/N	Manufacturer
CN1	RE-H052SD-1110	J.S.T. Mfg Co., Ltd
CN3	S3B-PH-K-S	J.S.T. Mfg Co., Ltd
CN5	S2B-PH-K-S	J.S.T. Mfg Co., Ltd

4. Operation modes and functions

4-1. Outline

enters the Initialization mode immediately after it is turned on or reset. In this mode, no setting is made and each mode shall be set. To transition to the available state, select the coordinate output rate and coordinate output mode and set the operation mode.

§ Initialization mode

By either power supply ON or hardware reset/software reset, the internal initial setting is performed. In the serial scheme, communication with host is available. In USB scheme, device recognition process ends. In this mode, both serial and USB schemes receive a coordinate output rate command and transition to the idle mode.
After hardware reset, it takes 500ms to transition to the initialization mode.
In using the EEPROM, EEPROM data is read in this mode.

§ Idle mode

enters this operation waiting mode after the coordinate output rate setting command is received. Transition to each mode takes place in this mode.

§ Coordinate data mode

In this mode, analog data obtained from touch screen is output as coordinate data with 10 bit resolution without any calibration.
This mode starts in the "idle mode" by receiving the coordinate data send start command, and returns to "idle mode" again after receiving the coordinate data send end command. By receiving reset command, it transitions to the "initialization mode".
This mode is used when host driver implements the calibration function, and also when necessary data is obtained in the calibration data setup mode.

§ Calibration data setup mode

In this mode, calibration data used in "calibration data mode" is set. Transition to this mode takes place when the setup mode start command is received in the idle mode. Select an appropriate calibration point among:
- X=2, Y=2 (four point calibration)
- X=3, Y=3 (nine point calibration) and
- X=2, Y=2 (four point calibration) plus one center position (five point calibration)
When this mode ends, calibration data is entered to EEPROM.

§ Calibration data read mode

In this mode, setup data is read out from EEPROM if in using EEPROM, data set in the "calibration data setup mode" is stored to EEPROM. It is used if setting data is to be confirmed. Transition to this mode takes place and calibration data is output to the host if in the idle mode, calibration data read command is received.

§ Calibration data mode

In this mode, individual difference and loss in the touch screen are corrected and coordinate value output is performed. Using calibration data set in the "calibration data setup mode", touch screen input point and indicator's cursor display position can be matched.
In using this mode, the host driver needs no calibration function.
Using "calibration data setup mode" setting value to set the coordinate data maximum value, maximum value can be limited to 10bits or less.
This mode starts when in the idle mode, any "calibration data send start command" is received, and returns to the idle mode when receiving the calibration data send end command. When receiving the reset command, this mode transitions to the initialization mode.

§   STOP mode

This mode is enabled only in the serial communication. This mode starts when in the idle mode, STOP mode start command is received. This mode stops ceramic vibrator's vibration and enters the power saving mode where the operation stops. By hardware reset, this mode transitions to the initialization mode. By receiving [00h] (null command) from host, the power saving mode ends and transitions to the idle mode.

§   Power-save mode

This mode is only enabled in the serial communication. If in the coordinate data mode transitioned from [01h] or the calibration data mode transitioned from [0Ah], there are no inputs on the touch screen for 20 samplings, the ceramic vibrator stops its vibration and enters the power saving mode where no operations are taken. By inputting the touch screen or receiving a command from host, power saving mode is released and the transition to "coordinate data mode " or "calibration data mode" takes place.

4-2. Initialization mode and idle mode

After the power up or hardware reset, internal initialization setting is performed (about 500ms) and the transition to the initialization mode occurs, where waiting for the communication with host. In this mode, if external EEPROM is used, EEPROM data is read.

In the initialization mode, use the coordinate output rate setting command to set the interval for sending a coordinate. Where, touch screen connection state and EEPROM data are checked and in either normal or abnormal case, data representing each state is output to the host. Thus, the initialization mode transitions to the idle mode. Transition to each mode occurs from the idle mode. Once coordinate output rate is set with transition to the idle mode, coordinate output rate setting may be available again.

If in either idle mode, coordinate data mode or calibration data mode, reset command is received, transition to the initialization mode occurs. Where, after receiving the reset command, internal processing takes a time, be sure to issue subsequent commands after 6ms or more is elapsed.

§ Mode transition
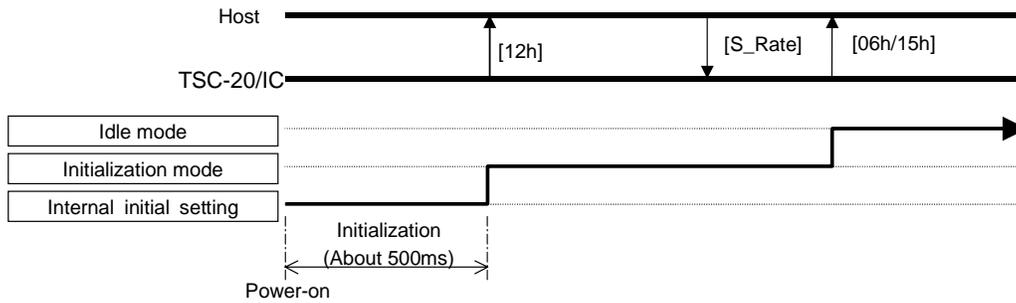
*After application of power (hardware-reset), to tell a host computer having changed into the state where can communicate, it outputs "12h". But, "12h" is not outputted when software-reset is carried out.

§ Coordinate output rate setting command (S_Rate)

Mode	Sampling	Command	Description
Stream	30p/s	05h+40h	
	50p/s	05h+41h	
	80p/s	05h+42h	
	100p/s	05h+43h	
	130p/s	05h+44h	
	150p/s	05h+45h	
Point	Once when touched	05h+50h	In the coordinate (calibration) data mode, no pen-up data is output.

§ Response command (no EEPROM is used)

State	Response command	Byte width	Description of mode
Normal	06h (ACK)	1 byte	Touch screen connection normal
Abnormal	15h (NAK)	1 byte	Touch screen not connected

§ Response command (EEPROM is used)

State	Response command	Byte width	Description of mode
Normal	06h (ACK)	1 byte	Touch screen connection, EEPROM data normal
Abnormal	15h (NAK) + detail code		
	bit0=1 (01h)	2 bytes	EEPROM data empty
	bit1=1 (02h)		EEPROM data abnormal
	bit2=1 (04h)		EEPROM write error
	bit3=1 (08h)		Touch screen not connected

* If, in the initialization mode, coordinate output rate setting is performed, EEPROM is checked if data is present or not. Thus, error code only refers to EEPROM data empty (detail code: 01h). In the idle mode, run the calibration data setup mode. After EEPROM data abnormal or EEPROM write error occurs, set the coordinate output rate, error code is output, indicating EEPROM data abnormal or EEPROM write error. Error flag can be deleted by either hardware reset or software reset.
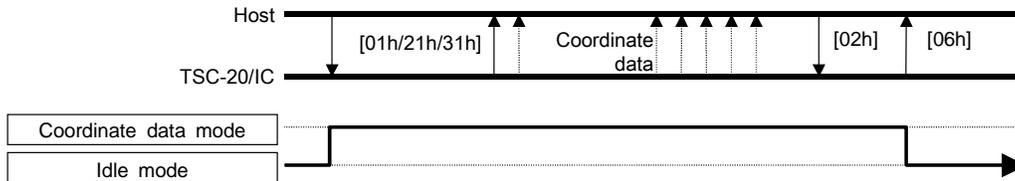
4-3. Coordinate data mode

Analog data input from analog touch screen is A/D converted for calculating the coordinate data, which is output in this mode.

This mode is used if calibration is made in the host driver. In using the external EEPROM in the calibration data mode, previously performed "calibration data setup mode" needs raw data, which is obtained in this mode.

From the idle mode, this mode starts by receiving either command of coordinate data send start 1 – 3, and returns to the idle mode by receiving the coordinate data send end command. By receiving "reset" command, the mode transition to the initialization mode.

At the touch screen input (when a finger or pen touches on the touch screen), coordinate data, including pen-down ID indicating that touch screen is input, is output to the host with coordinate output rate interval. If the touch screen input ends (when a finger or pen leaves the touch screen), pen-up ID of 1byte is output (excluding the point mode).

§ Mode transition

§ Command and each mode function

Mode name	Command	Function
Coordinate data send start 1	01h	Pen-down: Coordinate data including pen-down ID is output with the coordinate output rate interval. Pen-up: Pen-up ID is output one time. No input: If there are no inputs for 20 sampling times, transition to the power-save mode occurs.
Coordinate data send start 2	21h	Pen-down: Coordinate data including pen-down ID is output with the coordinate output rate interval. Pen-up: Coordinate data including pen-up ID is output with the co-ordinate output rate interval. No input: No transition to the power-save mode.
Coordinate data send start 3	31h	Pen-down: Coordinate data including pen-down ID is output with the coordinate output rate interval. Pen-up: Pen-up ID is output one time. No input: No transition to the power-save mode.
Coordinate data send end	02h	Coordinate data mode ends and transition to the idle mode occurs.

§ Coordinate format

Pen-down data

	Meaning	b7	b6	b5	b4	b3	b2	b1	b0
Byte 0	Pen Down ID	SW0	SW1	0	1	0	0	0	1
Byte 1	X Upper	0	0	0	0	0	0	X9	X8
Byte 2	X Lower	X7	X6	X5	X4	X3	X2	X1	X0
Byte 3	Y Upper	0	0	0	0	0	0	Y9	Y8
Byte 4	Y Lower	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0

Pen-up data

	Meaning	b7	b6	b5	b4	b3	b2	b1	b0
Byte 0	Pen Up ID	SW0	SW1	0	1	0	0	0	0

List of Pen-down ID (pen-down data Byte 0)

ID	SW0	SW1
11h	0	0
51h	0	1
91h	1	0
D1h	1	1

List of pen-up ID (pen-up data Byte 0)

ID	SW0	SW1
10h	0	0
50h	0	1
90h	1	0
D0h	1	1

§ Example of Data (transmission starts at receiving [01h] or [31h]) (Where X = 0374h and Y = 01A9h)

Immediately after Pen-up, if the first sampling is pen-up, immediately preceding pen-down data is output. If second time sampling is pen-up, none is output. If third time sampling is pen-up, pen-up data is output once.

§ Example of data (transmission starts at receiving [21h])
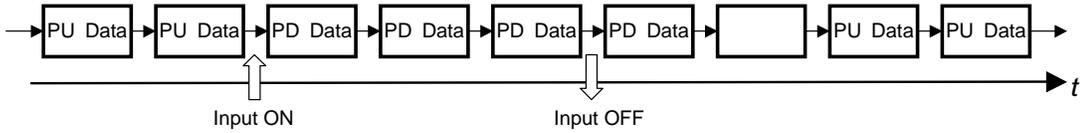

Input ON   Input OFF

*: Immediately after Pen-up, if the first sampling is pen-up, immediately preceding pen-down data is output. If second time sampling is pen-up, none is output. If third time sampling is pen-up, pen-up data is output. Thereafter, pen-up data is output at the coordinate output rate interval. Coordinate value at pen-up always takes same coordinate value as the last pen-down data. After the coordinate data mode transition until the first pen-down, 0000h is output.

§ Power-save mode
"Coordinate data send start 1" command (01h) activates the transition to the coordinate data mode. If for 20 sampling times (Example: 100p/s = 200ms), no touch screen is input, ceramic vibrator's vibration stops and the operation ends by entering the power saving mode. Input to the touch screen (analog data input) or command reception from host will release this mode, and after the vibration stabilization time elapses (6ms), the operation returns to the coordinate data mode.
If receives "coordinate data mode end" command (02h), this mode shall be released. Thus, within 20 sampling times in the condition where either command (or touch screen input) releases this mode, [02h] shall be received.
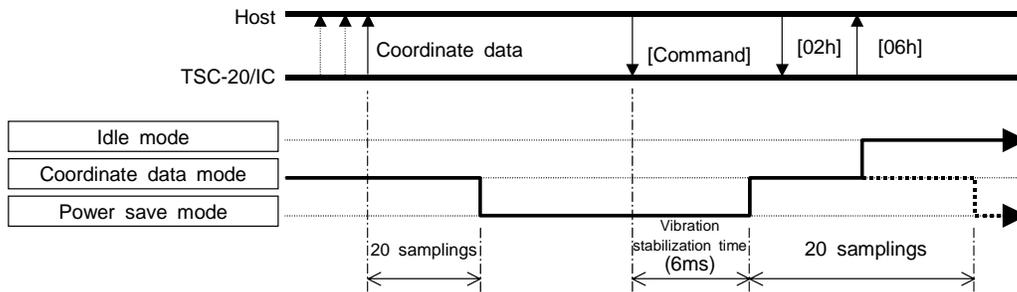
4-4. Calibration data setup mode

On the touch screen, due to offset and rotation caused by shifted pasting on touch screen and elements such as losses from surrounding circuit, touch screen input point and indicator coordinate indication may be unmatched with each other if A/D conversion value is output as coordinate value.
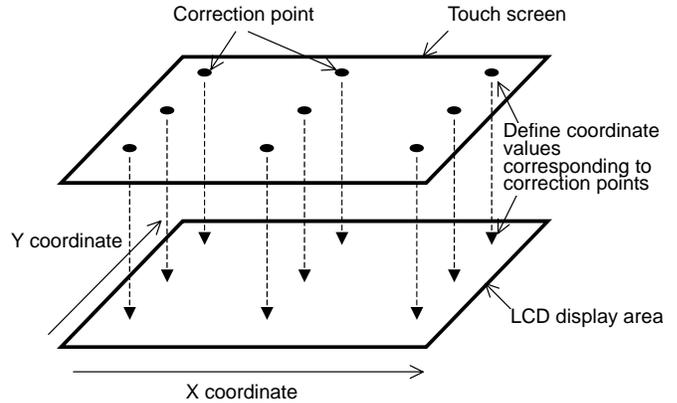
To resolve this, defines in advance any point on touch screen as a calibration point, where the calibration point's raw coordinate (A/D conversion value) and calibration coordinate value to be output to the host after calibration, and in the actual operation, from defined coordinate value, corresponding calibration coordinate value of touch screen input point's raw coordinate is calculated and output to the host (calibration data mode).

In this mode, data required for calibration is set up. Number of maximum calibration points is nine in total with X = 3 and Y = 3.
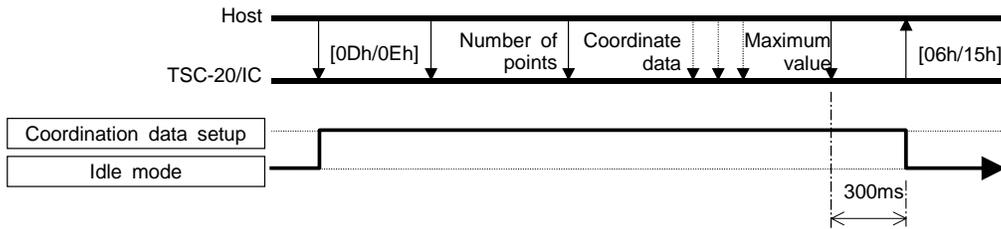
For setup in this mode, coordinates of calibration points in the coordinate data mode shall be obtained in advance.

By receiving setup mode start command in the idle mode, the operation transitions to this mode and after setup processing ends, data corresponding to the normal end or abnormal end is output to the host, then the operation returns to the idle mode.

If the external EEPROM is used, this processing writes data to EEPROM.

§ Mode transition

| Host | [0Dh/0Eh] | Number of points | Coordinate data | Maximum value | [06h/15h] |

TSC-20/IC

Coordination data setup

Idle mode

300ms

*Within 300 msec after the last data (calibration data maximum value) is received and until the operation transitions to the idle mode, no command reception is available.

§ Command

Mode	Command	Function
Setup mode start 1	0Dh	Normal calibration (Specify the number of calibration points in X and Y each)
Setup mode start 2	0Eh	Five point calibration (four points at touch screen's 4 corners and one point at the center)

§ Response command (no EEPROM is used)

State	Response command	Bit width	Mode description
Normal	06h (ACK)	1 byte	Setting completed
Abnormal	15h (NAK)	1 byte	Parameter abnormal

§ Response command (EEPROM is used)

State	Response command	Bit width	Mode description
Normal	06h (ACK)	1 byte	EEPROM write normal
Abnormal	15h (NAK) + detail code	2 bytes	
	bit1=1 (02h)		EEPROM data abnormal
	bit2=1 (04h)		EEPROM write error

§ Setup procedure
1. Define calibration point and number of calibration points and display a cross mark and arrow on indicator to obtain coordinate values at the calibration point in the coordinate data mode.
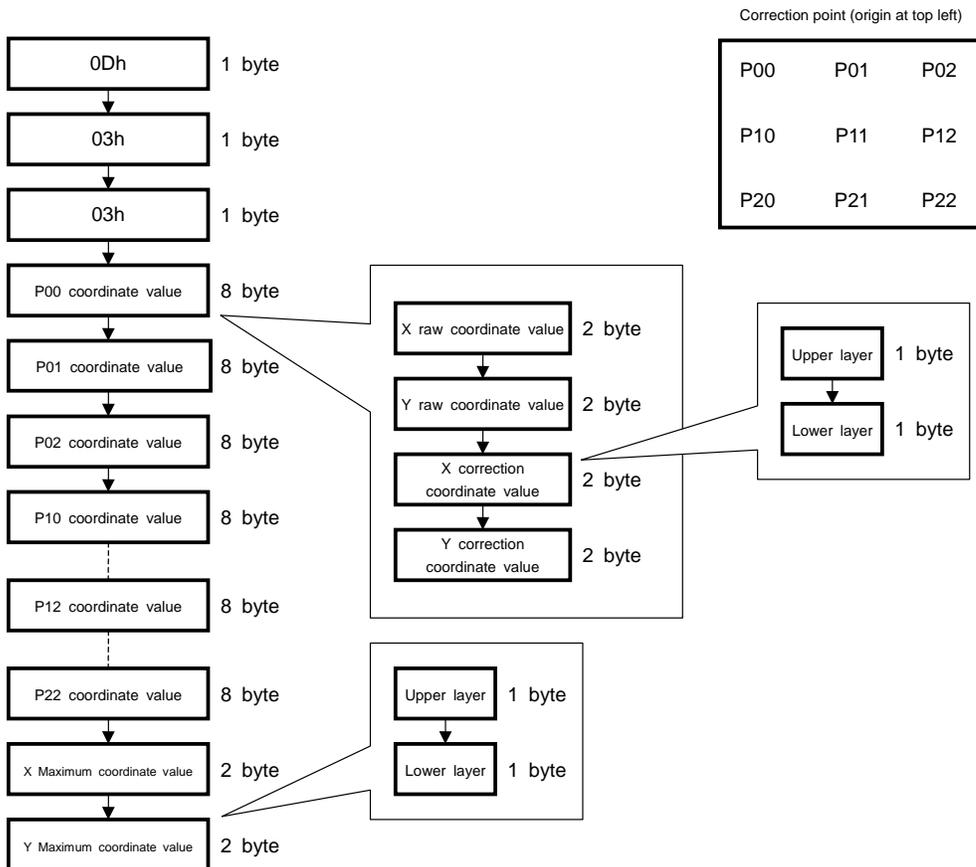2. Transmit command [0Dh/0Eh] to (transition to "calibration data setup mode"), and input data according to the calibration data setting format. After all data are input, ACK/NAK is output to the host and the operation automatically transitions to the idle mode.

```
    Idle mode
        |
        v
Coordinate data mode  <--- Retrieve raw data of
        |                   correction points
        v
    Idle mode
        |
        v
Coordination data setup  <--- Input raw data of correction
        |                      points, correction data and
        v                      maximum coordinate value
    Idle mode
```
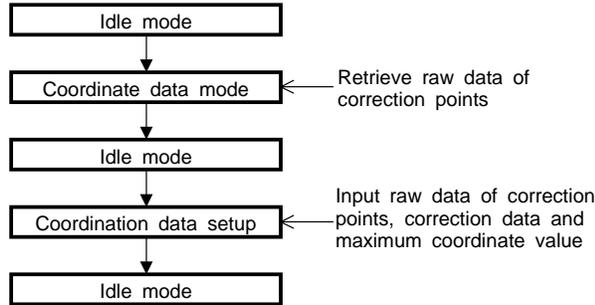
§ Calibration data setting format
1. Number of points: X direction = 3, Y direction = 3 (Maximum coordinate value: 0000h - 03FFh)

Correction point (origin at top left)

P00	P01	P02
P10	P11	P12
P20	P21	P22

```
0Dh                         1 byte
03h                         1 byte
03h                         1 byte
P00 coordinate value        8 byte  ----> X raw coordinate value     2 byte
P01 coordinate value        8 byte        Y raw coordinate value     2 byte
P02 coordinate value        8 byte        X correction              2 byte  ----> Upper layer  1 byte
P10 coordinate value        8 byte        coordinate value                        Lower layer  1 byte
P12 coordinate value        8 byte        Y correction              2 byte
P22 coordinate value        8 byte        coordinate value
X Maximum coordinate value  2 byte  ----> Upper layer  1 byte
Y Maximum coordinate value  2 byte        Lower layer  1 byte
```
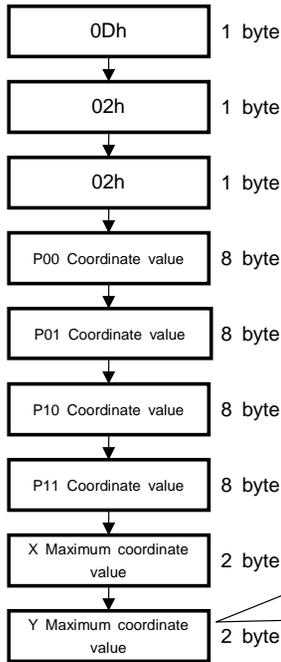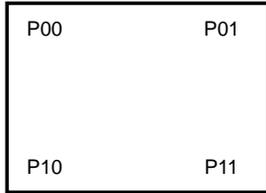
2. Number of points: X = 2, Y = 2 and 5 point
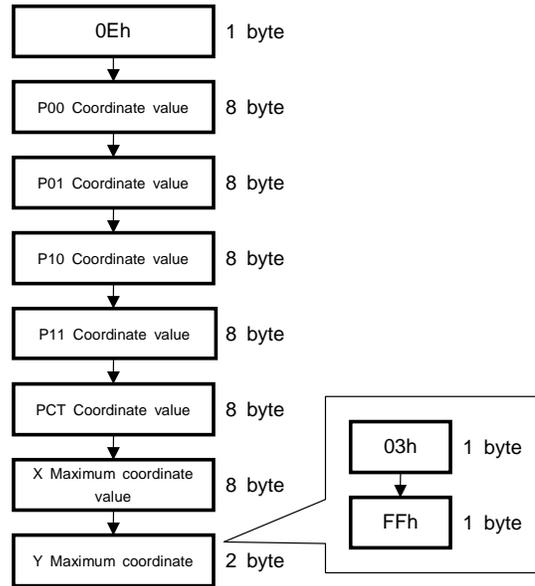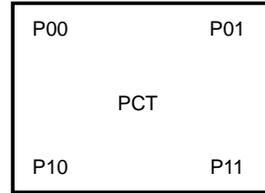
X=2, Y=2 (Maximum coordinate value: X=03FFh, Y=03FFh)   5 Point (Maximum coordinate value: X=03FFh, Y=03FFh)

Correction point (origin: top left)

| P00 | P01 |
| P10 | P11 |

Correction point (origin: top left)

P00		P01
	PCT	
P10		P11

0Dh	1 byte
02h	1 byte
02h	1 byte
P00 Coordinate value	8 byte
P01 Coordinate value	8 byte
P10 Coordinate value	8 byte
P11 Coordinate value	8 byte
X Maximum coordinate value	2 byte
Y Maximum coordinate value	2 byte

03h	1 byte
FFh	1 byte

0Eh	1 byte
P00 Coordinate value	8 byte
P01 Coordinate value	8 byte
P10 Coordinate value	8 byte
P11 Coordinate value	8 byte
PCT Coordinate value	8 byte
X Maximum coordinate value	8 byte
Y Maximum coordinate	2 byte

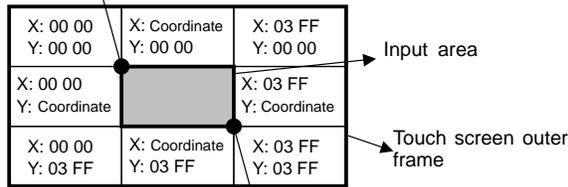|	
03h	1 byte
FFh	1 byte

* PCT is at the center of indicator.

§   Handling outside the coordinate range
    If a portion only of the touch screen is to be operated, some calibration may cause the touch screen input
    points even inside the input area to be located outside the maximum coordinate point (or minimum co-
    ordinate point). Where, touch screen input is not disabled and the following data is transmitted.

Minimum coordinate value (X = 00 00, Y= 00 00)

X: 00 00 Y: 00 00	X: Coordinate Y: 00 00	X: 03 FF Y: 00 00
X: 00 00 Y: Coordinate		X: 03 FF Y: Coordinate
X: 00 00 Y: 03 FF	X: Coordinate Y: 03 FF	X: 03 FF Y: 03 FF

Input area

Touch screen outer frame

Maximum coordinate value (X = 03 FF, Y= 03 FF)

4-5. Calibration data read mode

In this mode, data set in the calibration data setup mode is read from EEPROM, used to check the parameter setting.

This mode is executed from idle mode to transmit the stored calibration data, then the operation automatically transitions to idle mode. If no calibration data is stored in EEPROM, none is output.
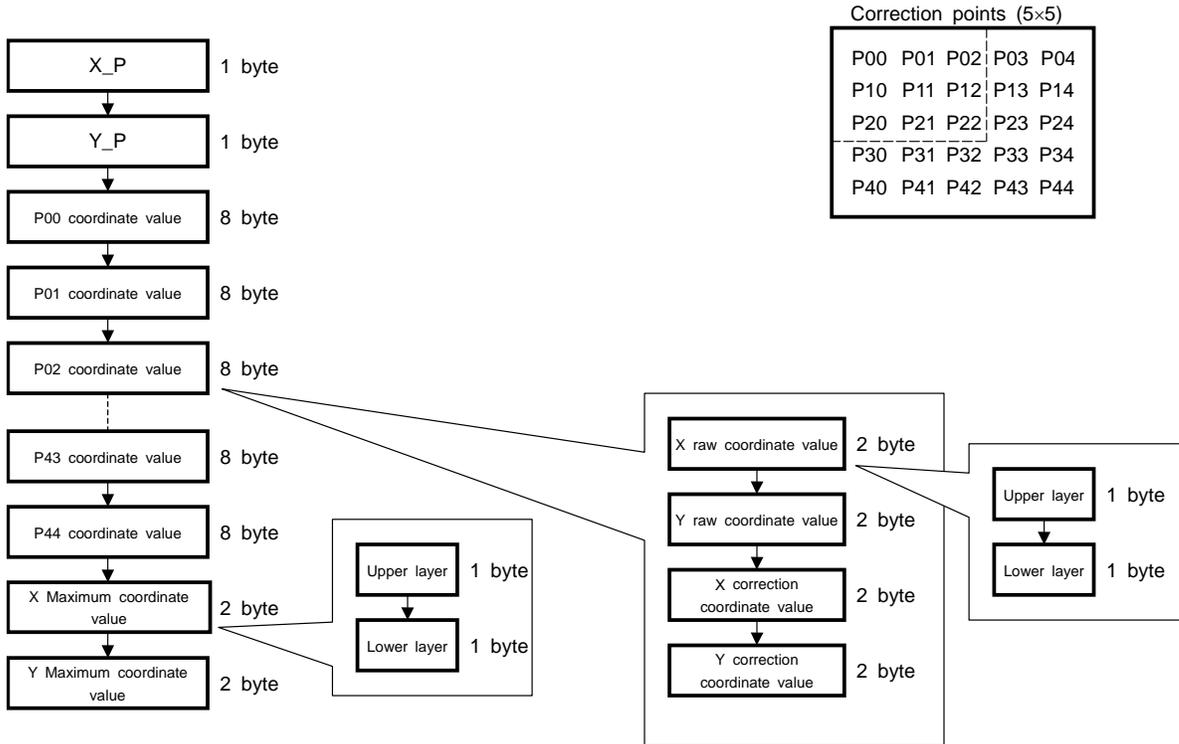
Note) In this mode, number of calibration points is treated with 25 point (X=5, Y=5) format, since FIT-10/IC, a touch screen controller IC, supports the maximum 25 point calibration function and protocol compatibility in the serial mode shall be kept with FIT-10/IC. Coordinate data of calibration points not supported by are all output with 0000h.

§ Mode transition

Host

[1Dh] | Number of points | Coordinate data | Maximum

TSC-20/IC

Correction data read mode
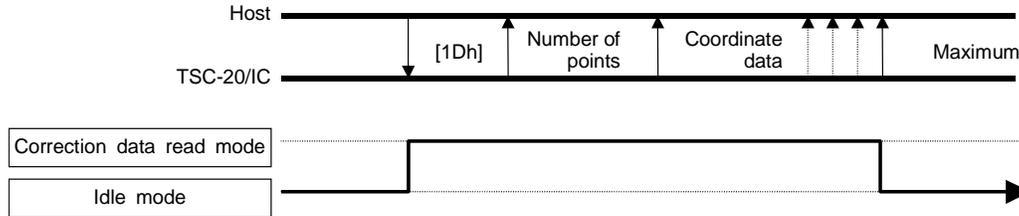
Idle mode

§ Calibration data send format

In the idle mode, if 1Dh is received, calibration data is sent to the host with the following format. In the calibration data setup mode, if setup mode start 2 (0Eh) is used, data is converted to nine point calibration (X=3, Y=3) for setup mode start 1 (0Dh) then stored, thus if output to the host, it uses nine point calibration format.

Correction points (5×5)

P00	P01	P02	P03	P04
P10	P11	P12	P13	P14
P20	P21	P22	P23	P24
P30	P31	P32	P33	P34
P40	P41	P42	P43	P44

X_P — 1 byte
Y_P — 1 byte
P00 coordinate value — 8 byte
P01 coordinate value — 8 byte
P02 coordinate value — 8 byte
P43 coordinate value — 8 byte
P44 coordinate value — 8 byte
X Maximum coordinate value — 2 byte
Y Maximum coordinate value — 2 byte

Upper layer — 1 byte
Lower layer — 1 byte

X raw coordinate value — 2 byte
Y raw coordinate value — 2 byte
X correction coordinate value — 2 byte
Y correction coordinate value — 2 byte

Upper layer — 1 byte
Lower layer — 1 byte

4-6. Calibration data mode

In this mode, based on calibration value obtained from the calibration data setup mode, coordinate value is corrected and output. In this mode, maximum output coordinate value can be limited.

From the idle mode, this mode starts by receiving either command of coordinate data send start 1 – 3, and returns to the idle mode by receiving the calibration data send end command. By receiving "reset" command, the mode transition to the initialization mode.

At the touch screen input (when a finger or pen touches on the touch screen), coordinate data, including pen-down ID indicating that touch screen is input, is output to the host with coordinate output rate interval. If the touch screen input ends (when a finger or pen leaves the touch screen), pen-up ID of 1byte is output (excluding the point mode).

§   Mode transition
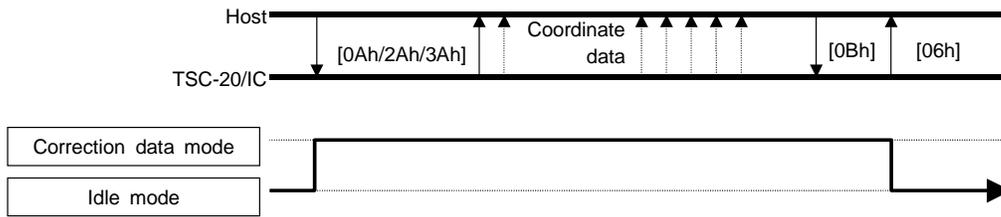
§   Command and mode function

Mode name	Command	Function	
Calibration data send start 1	0Ah	Pen-down:	Coordinate data including pen-down ID is output with the coordinate output rate interval.
		Pen-up:	Pen-up ID is output one time.
		No input:	If there are no inputs for 20 sampling times, transition to the power-save mode occurs.
Calibration data send start 2	2Ah	Pen-down:	Coordinate data including pen-down ID is output with the coordinate output rate interval.
		Pen-up:	Coordinate data including pen-up ID is output with the coordinate output rate interval.
		No input:	No transition to the power-save mode.
Calibration data send start 3	3Ah	Pen-down:	Coordinate data including pen-down ID is output with the coordinate output rate interval.
		Pen-up:	Pen-up ID is output one time.
		No input:	No transition to the power-save mode.
Calibration data send end	0Bh	Coordinate data mode ends and transition to the idle mode occurs.	

§   Power-save mode

"Coordinate data send start 1" command (0Ah) activates the transition to the coordinate data mode. If for 20 sampling times, no touch screen is input, ceramic vibrator's vibration stops and the operation ends by entering the power saving mode. Input to the touch screen (analog data input) or command reception from host will release this mode, and after the vibration stabilization time elapses (6ms), the operation returns to the calibration data mode.

If receives "calibration data mode end" command (0Bh), this mode shall be released. Thus, within 20 sampling times in the condition where either command (or touch screen input) releases this mode, [0Bh] shall be received.
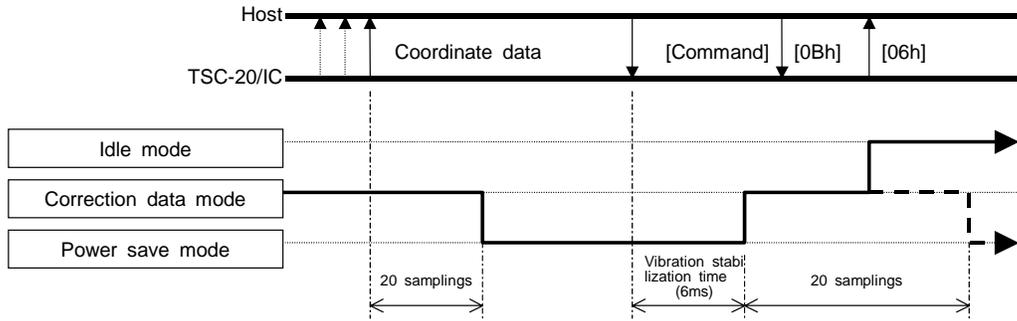
§ Data description

Pen-down data

	Meaning	b7	b6	b5	b4	b3	b2	b1	b0
Byte 0	Pen Down ID	SW0	SW1	0	1	0	0	0	1
Byte 1	X Upper	0	0	0	0	0	0	X9	X8
Byte 2	X Lower	X7	X6	X5	X4	X3	X2	X1	X0
Byte 3	Y Upper	0	0	0	0	0	0	Y9	Y8
Byte 4	Y Lower	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0

Pen-up data

	Meaning	b7	b6	b5	b4	b3	b2	b1	b0
Byte 0	Pen Up ID	SW0	SW1	0	1	0	0	0	0

List of pen-down ID (pen-down data Byte 0)

ID	SW0	SW1
11h	0	0
51h	0	1
91h	1	0
D1h	1	1

List of pen-up ID (pen-up data Byte 0)

ID	SW0	SW1
10h	0	0
50h	0	1
90h	1	0
D0h	1	1

§ Example of data (transmission starts by receiving [0Ah] or [3Ah]) (Where, X = 0374h and Y = 01A9h)

Immediately after Pen-up, if the first sampling is pen-up, immediately preceding pen-down data is output. If second time sampling is pen-up, none is output. If third time sampling is pen-up, pen-up data is output once.

§ Example of data ([transmission starts by receiving 2Ah])
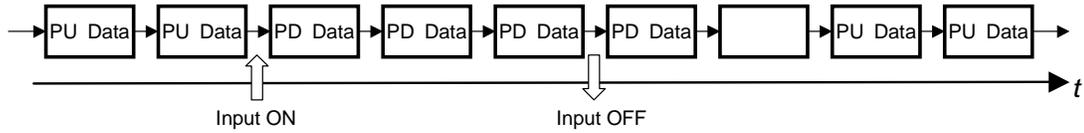

Input ON   Input OFF

*: Immediately after Pen-up, if the first sampling is pen-up, immediately preceding pen-down data is output. If second time sampling is pen-up, none is output. If third time sampling is pen-up, pen-up data is output. Thereafter, pen-up data is output at the coordinate output rate interval. Coordinate value at pen-up always takes same coordinate value as the last pen-down data. After the coordinate data mode transition until the first pen-down, 0000h is output.

4-7. STOP mode
This mode starts by receiving [0Fh] (STOP mode start command) in the idle mode. In this mode, ceramic vibrator's vibration stops and operation also stops in the power consumption mode. If hardware is reset, the operation transitions from this mode to initialization mode. By receiving [00h] (null command) from host, CPU STOP mode is released and after vibration stabilize waiting time (6ms) is elapsed, the operation enters idle mode.
This mode operates in the serial mode only.
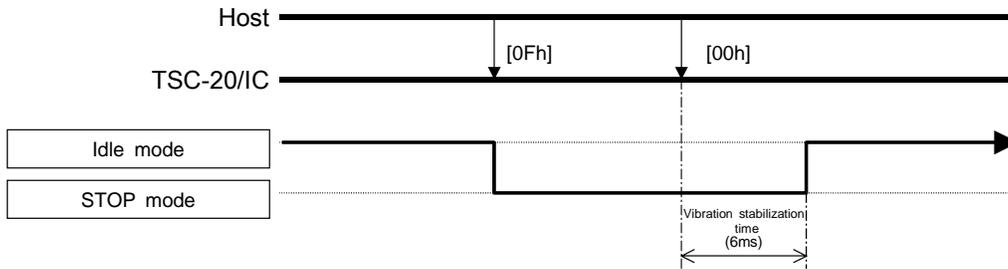
4-8. Panel ID/mode information acquisition

This function is used to obtain panel ID in the USB mode, current transition mode, and used/unused status information of SW0, SW1 and EEPROM. It is used to know the current operation status.

This function is available in initialization mode, idle mode, coordinate data mode and calibration data mode. Panel ID is enabled by releasing hardware reset. Thus, if, after hardware reset, pin information was changed, restart the power or reset hardware to enable the setting.

Mode information always outputs the last command. Therefore, be sure that even in the idle mode, output data differs per last command.

This function is used to check current mode, and used/unused status of SW0, SW1 and EEPROM. Pin number 3 (SEL1) setting allows you to obtain the panel ID information, though this function is unavailable in serial mode in terms of objectives of panel ID.
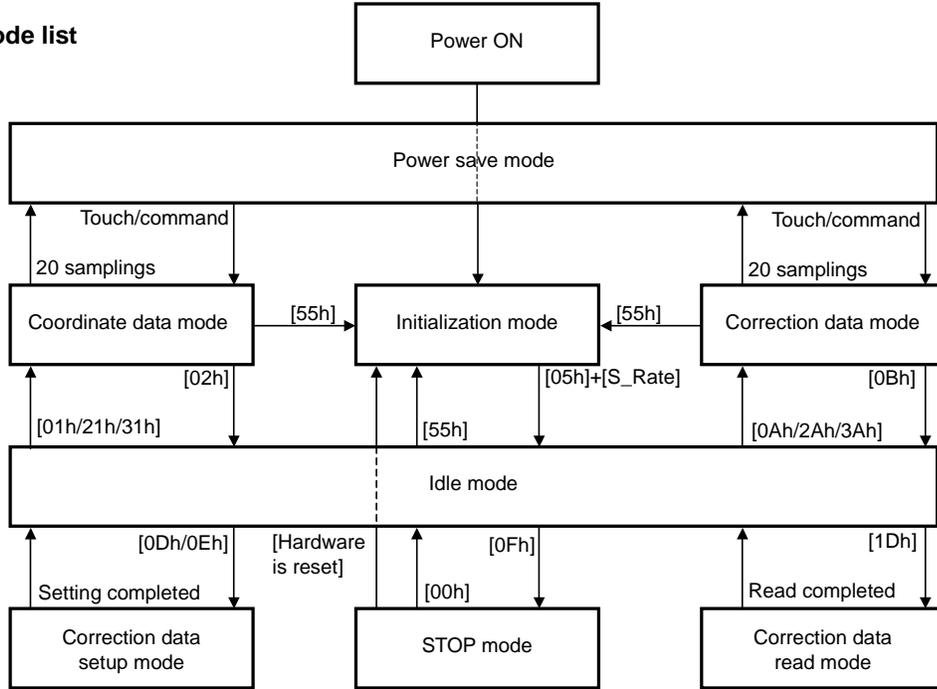
§ Command

Command	Output data	Command enabled mode	
15h	2 bytes	Initialization	mode
		Idle	mode
		Coordinate (calibration) data mode	

§ Description of output data

Data content: Byte 1 (Upper bits: b15 - b8) includes the transition mode information, and byte 2 (lower bits: b7 - b0) outputs the setting information. In the serial mode, b4 is fixed to "0".

Bit	Bit information		
b0	Fixed to "0"		
b1	Panel ID (pin number 3)	"1" = PID 1	"0" = PID 0
b2	SW1 (pin number 28)	"1" = SW ON	"0" = SW OFF
b3	SW0 (pin number 29)	"1" = SW ON	"0" = SW OFF
b4	USB/RS (pin number 25)	"1" = USB	"0" = RS
b5	Fixed to "0"		
b6	Fixed to "1"		
b7	SEL4/EEP-CS (pin number 16)	"1" = EEPROM Unused	"0" = EEPROM Used
b8-15	Transition mode information		
	00h: initialization mode		
	05h: idle mode (immediately preceding command sets the coordinate output rate)		
	01h: coordinate data mode start 1		
	21h: coordinate data mode start 2		
	31h: coordinate data mode start 3		
	02h: idle mode (immediately preceding command is 02h)		
	0Ah: calibration data mode start 1		
	2Ah: calibration data mode start 2		
	3Ah: calibration data mode start 3		
	0Bh: idle mode (immediately preceding command is 0Bh)		

4-9. Mode list

4-10. Command list

Command	Accompanying command (byte)	ACK/NAK	Name
00h	-	-	Null
05h	1	ACK/NAK	Coordinate output rate setting
01h	-	-	Coordinate data send start 1
21h	-	-	Coordinate data send start 2
31h	-	-	Coordinate data send start 3
02h	-	ACK	Coordinate data send end
0Ah	-	-	Calibration data send start 1
2Ah	-	-	Calibration data send start 2
3Ah	-	-	Calibration data send start 3
0Bh	-	ACK	Calibration data send end
0Dh	-	ACK/NAK	Calibration data setup mode start 1
0Eh	-	ACK/NAK	Calibration data setup mode start 2
1Dh	-	-	Calibration data read
0Fh	-	ACK	STOP mode start
55h	-	ACK	Reset
15h	-	-	Panel ID/ mode information retrieval

§ Wait after issuing command
After issuing the following commands, wait as specified before issuing the next command.

Command name	Serial command	Wait time
Reset	55h	6ms
Calibration data setup (1)	0Dh	300ms after issuing last data
Calibration data setup (2)	0Eh	300ms after issuing last data
Calibration data read	1Dh	0ms after reading last data (no wait required)

5. Changes & Improvements
5-1. Version History
§   48-B-5-04 and 48-B-5-05
   Ver1.0 (October 12, 2006)
   First Edition.

6. Warranty
6-1. Warranty Period
§ The warranty period is limited to 1 year from the date of shipping. The warranty for the initial defection such as appearance defection is limited to 1 month.

§ Any defected parts under proper use will be examined by the supplier and replaced by the new parts if the defection is considered to be caused by the supplier.

§ The replacement is subject to be included in the next lot.

6-2. Warranty Target
§ The warranty only covers the product itself and does not cover any damage to others caused by using this product. Onsite repair or replacement is not supported.

§ We will do our best for delivery problem and product defections, but the warranty for the production line is not covered.

6-3. Warranty Exceptions
Following conditions are not covered with the warranty and subject to charge.

§ Any malfunctions and damages during transportation and transfer by the user.

§ Any malfunctions and damages caused by a natural disaster or a fire.

§ Any malfunctions and damages caused by static electricity

§ Any malfunctions and damages caused by the failure of the associated equipment.

§ If the product is remodeled, disassembled or repaired by the user.

§ If the product is glued onto the equipment and uninstalled.

§ Any malfunctions and damages caused by an improper usage and handling against the specifications and notes.

7. Precautions for Use

7-1. General Handling

§ Keep the product away from any conductive objects while in use.

§ Do not touch the conductive part of the product to avoid being damaged by the electrostatic discharge.
  Follow the proper procedure for handling.

§ Keep the product in the proper storing environment and avoid any load to the product.

§ Do not use or store the product in the severe condition like following:
  Wet environment or a condition where the product is likely to get wet.
  Where dew condensation is likely to occur.
  Near solvent or acid.

§ Do not take apart or alter the product.

7-2. Others

§ The contents of this document are subject to change without notice.

§ The manufacturer or sales representatives will not be liable for any damages or loss arising from use of this product.

§ This product is intended for use in standard applications (computers, office automation, and other office equipment, industrial, communications, and measurement equipment, personal and household devices, etc.) Please avoid using this product for special applications where failure or abnormal operation may directly affect human lives, or cause physical injury or property damage, or where extremely high levels of reliability are required (such as aerospace systems, vehicle operating control, atomic energy controls, medical devices for life support, etc.).

§ Any semiconductor devices have inherently a certain rate of failure. The user must protect against injury, damage, or loss from such failures by incorporating safety design measures into the user's facility and equipment.

48-B-5-04 and 48-B-5-05 User's Guide

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