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REVISIONS

REV.	DESCRIPTION	DATE	APPROVED
01	PRE-RELEASE	3/19/99	M.A.

1. **Specification subject to change without notice.**
2. **All dimensions and specifications apply to standard modules. This information may vary for modules with optional features.**
3. **All dimensions are in millimeters.**
4. **Precautions: These precautions apply equally to modules from all makers, not just Densitron. Violation of these guidelines may void the warranty and can cause problems ranging from erratic operation to catastrophic display failure.**

*Handling precautions:*

- ◆ This device is susceptible to Electro-Static Discharge (ESD) damage. Observe Anti-Static precautions.

*Power supply precautions:*

- ◆ Identify and, at all times, observe absolute maximum ratings for both logic and LC drivers. Note that there is some variance between models.
- ◆ Prevent the application of reverse polarity to V<sub>DD</sub> and V<sub>SS</sub>, however briefly.
- ◆ Use a clean power source free from transients. Power up conditions are occasionally "jolting" and may exceed the maximum ratings of the module.
- ◆ The +5V power of the module should also supply the power to all devices which may access the display. Don't allow the data bus to be driven when the logic supply to the module is turned off.
- ◆ DO NOT install a capacitor between the V<sub>O</sub> (contrast) pin and ground. V<sub>DD</sub> must, at all times, exceed the V<sub>O</sub> voltage level. The capacitor combines with the contrast potentiometer to form an R-C network which "holds-up" V<sub>O</sub>, at power-down, possibly damaging the module.

*Operating precautions:*

- ◆ DO NOT plug or unplug the module when the system is powered up.
- ◆ Minimize the cable length between the module and host MPU. (Recommended max. length 30 cm).
- ◆ For models with EL backlights, do not disable the backlight by interrupting the HV line. Unloaded inverters produce voltage extremes which may arc within a cable or at the display.
- ◆ Operate the module within the limits of the modules temperature specifications.

*Mechanical / Environmental precautions:*

- ◆ Improper soldering is the major cause of module difficulty. Use of flux cleaner is not recommended as they may seep under the elastomeric connection and cause display failure. Densitron recommends the use of Kester "245" no-clean solder.
- ◆ Mount the module so that it is free from torque and mechanical stress.
- ◆ Surface of LCD panel should not be touched or scratched. The display front surface is an easily scratched, plastic polarizer. Avoid contact and clean only when necessary with soft, absorbent cotton dampened with petroleum benzene.
- ◆ ALWAYS employ anti-static procedure while handling the module.
- ◆ Prevent moisture build-up upon the module and observe the environmental constraints for storage temperature and humidity.
- ◆ DO NOT store in direct sunlight.
- ◆ If leakage of the liquid crystal material should occur, avoid contact with this material, particularly ingestion. If the body or clothing becomes contaminated by the liquid crystal material, wash thoroughly with water and soap.

**Notes:** (unless otherwise specified)

Unless otherwise specified:  Dimensions are mm Tolerances are: X = ± 3 .X = ± 0.5 .XX = ± 0.05 FSCM NO. 62483	APPROVALS	DATE	<b>DENSITRON INTERNATIONAL PLC.</b>  TITLE <b>320 X 240 PIXEL INDUSTRIAL TOUCH MONITOR</b>	
	DRAWN			
	CHECKED		DWG. NO.	<b>TS4733</b>

## 1.0 DESCRIPTION

Industrial Touch Input Monitor consisting of a Liquid Crystal Display, analog resistive touch panel, CMOS driver and controller LSI, printed circuit board, metal support frame and array type Light Emitting Diode (LED) backlight.

Available LC fluids types are: NTN (supertwisted nematic), FSTN-H (film supertwisted nematic).

Options include on-board negative voltage generation and temperature compensation.

## 2.0 MECHANICAL CHARACTERISTICS

Item	Specifications	Unit
Package Dimensions	148.0 x 120.0 x 16.1	mm
Display format	240 x 320	-
Driving method	1/240	duty
Dot size	0.33 x 0.33	mm
Dot pitch	0.36 x 0.36	mm
Active display area	115.17 x 86.37	mm
Viewing area	120.0 x 92.0	mm
Weight		g
Surface hardness	>2H	H
Reflex Time	<30	mS
Touch Durability	1,000,000	Operations

Notes:W-Width;H-Height;D-Depth.

## 3.0 ABSOLUTE MAXIMUM RATINGS

V<sub>SS</sub>=0V;T<sub>a</sub>=25°C

Item	Symbol	NTN		FSTN-H		Unit
		Min.	Max.	Min.	Max.	
Logic supply voltage	V <sub>DD</sub> -V <sub>SS</sub>	0	7	0	7	V
LC driver supply voltage	V <sub>DD</sub> -V <sub>O</sub>	0	6	0	-25	V
Operating temperature	TOP	0	+50	-20	+70 (Note 3)	°C
Storage temperature (Note 1)	TST	-20	+70	-30	+80	
Humidity: Operating (@40°C)	-	-	85%	-	85%	RH (Note 2)
Non-operating (@40°C)	-	-	95%	-	95%	RH (Note 2)

Notes: 1: Tested to 100 hrs.  
2: Refers to non-condensing conditions.  
3: With backlight off.

## 4.0 ELECTRICAL CHARACTERISTICS

V<sub>DD</sub>=5±0.25V;T<sub>a</sub>=25°C

Item	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input "High" voltage	V <sub>IH</sub>	-	2.2	-	V <sub>DD</sub>	V
Input "Low" voltage	V <sub>IL</sub>	-	-	-	0.6	V
Output "High" voltage	V <sub>OH</sub>	I <sub>OH</sub> =0.205mA	2.4	-	-	V
Output "Low" voltage	V <sub>OL</sub>	I <sub>OL</sub> =1.2mA	-	-	0.4	V
Power supply current	I <sub>ee</sub>	V <sub>ee</sub> =-20V	-	7.0	-	mA
Power supply current	I <sub>dd</sub>	V <sub>dd</sub> =5.0 V	-	15.0	-	

## 4.1 TOUCH INPUT CHARACTERISTICS

ITO coating resistance	X axis 300-600 ohms Y axis 300-600 ohms
Action resistance	<3k ohms (when pressed with a rubber head at 100g force)
Power consumption	<1mA

## 5.0 RECOMMENDED LC DRIVE VOLTAGE ( $V_{DD}-V_O$ )

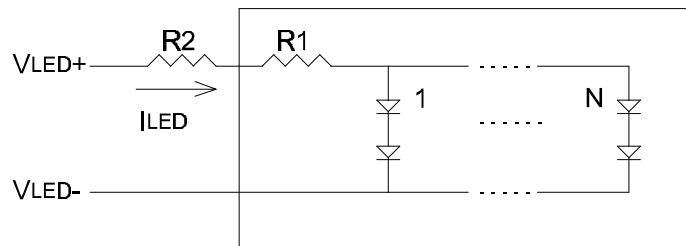
$V_{DD}=5.0\pm 0.25V$

Temperature	NTN (Blue Mode only)	FSTN-H (Transflective only)
Ta= -20°C		25.8
Ta= 0°C	23.8	23.8
Ta= 25°C	22.4	22.2
Ta= 50°C	21.3	20.6
Ta=70°C		18.8

## 6.0 BACKLIGHT SPECIFICATIONS:

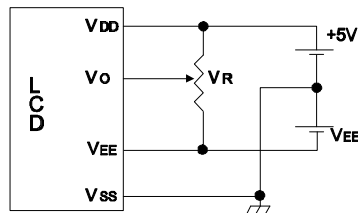
Ta=20°C,60%RH,Darkroom.

Item	Symbol	Typ.	Max.	Unit
LED input voltage	VLED	5.0	6.0	V
LED input current	ILED	850	900	mA
Built-in current limiting resistor	R1	-	-	Ohms, W
External current limiting resistor (recommended)	R2	1 Ohm, 2W	-	Ohms, W
Number of nodes	N	90	-	-

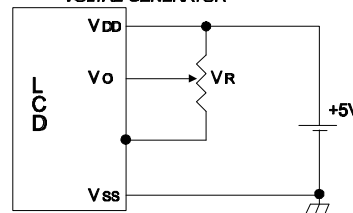


## 7.0 POWER SUPPLY

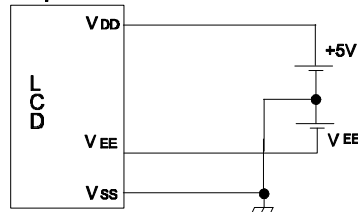
• NTN



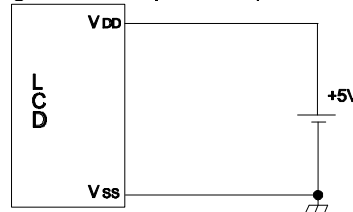
• NTN WITH ON-BOARD NEGATIVE VOLTAGE GENERATOR



• NTN with temperature compensation



• NTN with on-board negative voltage generator and temperature compensation

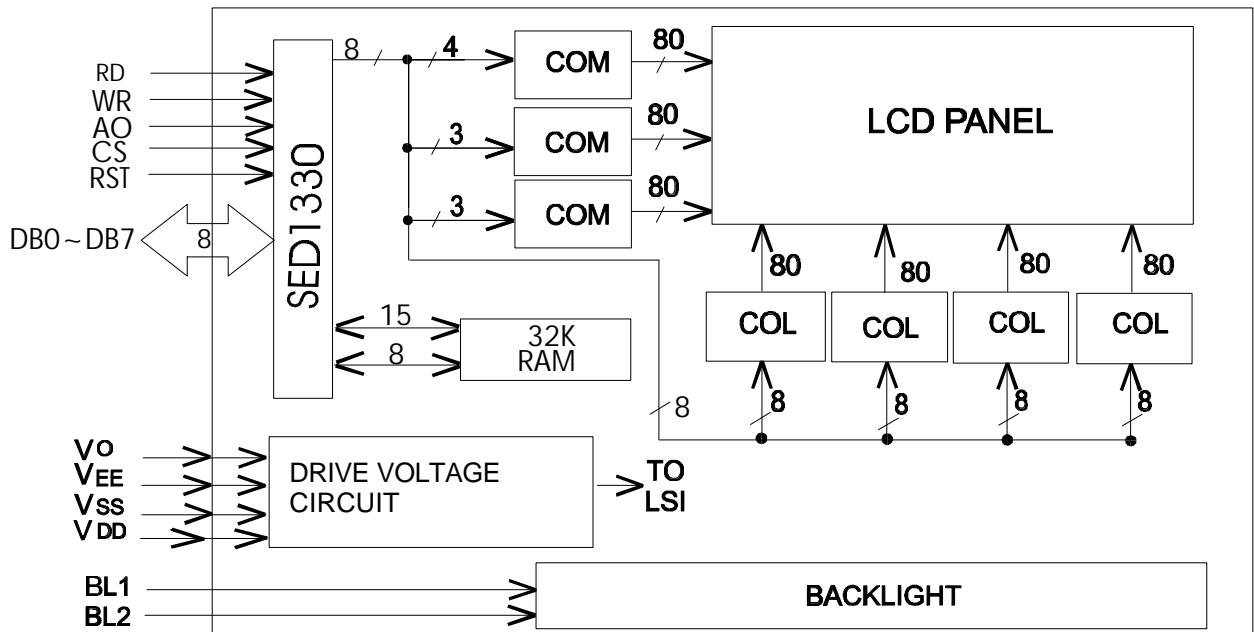


## 8.0 INTERFACE DESCRIPTION

Pin No.	Symbol	I/O	Function
1	Vss	-	Ground (0V)
2	VDD	-	Logic Supply Voltage (+5V)
3	Vo	-	LC Drive voltage for contrast adjustment
4	RD	I	Data read Active Low
5	WR	I	Data write active low
6	AO	I	Data type selection
7	DB0	I/O	Bi-directional data bus line 0
8	DB1	I/O	Bi-directional data bus line 1
9	DB2	I/O	Bi-directional data bus line 2
10	DB3	I/O	Bi-directional data bus line 3
11	DB4	I/O	Bi-directional data bus line 4
12	DB5	I/O	Bi-directional data bus line 5
13	DB6	I/O	Bi-directional data bus line 6
14	DB7	I/O	Bi-directional data bus line 7
15	CS	I	Chip enable active low
16	Reset	I	Chip reset active low
17	Vee	I(O)	negative voltage input for LC drive (negative voltage output for models with on-board negative voltage generator)
18	FG	I	Frame ground
19	NC	I	No Connection
20	NC	-	No Connection
BL1	VLED+	-	LED anode
BL2	VLED-	-	LED cathode
TS1	X1	I/O	analogue touch screen top bus bar
TS2	X2	I/O	analogue touch screen bottom bus bar
TS3	Y1	I/O	analogue touch screen left bus bar
TS4	Y2	I/O	analogue touch screen right bus bar

Note: programming notes for the SED1330 are available at [www.densitron.com](http://www.densitron.com)

## 9. BLOCK DIAGRAM:



## 10.0 DTSC01 CONTROLLER CIRCUIT (OPTIONAL)

The DTSC01 has been designed to allow the user simple TTL or RS232 serial interfacing to any 4,5 or 8 wire analog resistive touch system, for example the Densitron range of industrial touch monitors.

### Description

Once power is applied to the DTSC01, data is made available on the output of the PCB at connector J3 and J4.

This data appears in a constant stream containing the following:

- 10 bits of X position data
- 10 bits of Y position data
- 1 bit touch actuation control

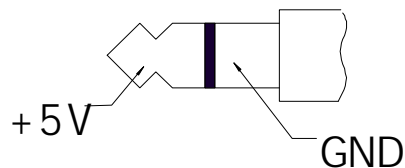
This data is sent in 3 packets of 8 bits.

In addition to the data output the DTSC01 will respond to a number of specific setup commands to tune the response of the touch panel to the application in which it is used. This consists of:

- ◆ Baud Rate
- ◆ Touch Mode
- ◆ Averaging
- ◆ Speed
- ◆ Noise rejection

### POWER

DTSC01 is a low power device. It requires  $5V \pm 20\%$  @ 20mA on J2 connector.



## SERIAL CONNECTOR

The interface with the PC is through a standard D-type connector.

D-type connector J3		
Pin No.	Symbol	Function
1	N/C	Not Connected
2	TxD	Transmit Data
3	RxD	Receive Data
4	N/C	Not Connected
5	GND	Ground
6	N/C	Not Connected
7	N/C	Not Connected
8	N/C	Not Connected
9	N/C	Not Connected

TTL level signals are output through optional pin header J4. It is useful for connecting to a microprocessor directly.

TTL level connector J4		
Pin No.	Symbol	Function
1	RxD TTL	Receive Data (TTL level)
2	TxD TTL	Transmit Data (TTL level)
3	TxD	Transmit Data
4	RxD	Receive Data
5	GND	Ground

## TOUCH OVERLAY CONNECTOR

Touch overlay connector J1		
Pin No.	Symbol	Function
1	SY-	Y-sense
2	Y-	Y-drive
3	SY+	Y+sense
4	Y+	Y+drive
5	SX-	X-sense
6	X-	X-drive
7	SX+	X+sense
8	X+	X+drive
9	S4	Not used
10	5W	5 <sup>TH</sup> wire sense
11	S3	Not used
12	GND	Ground
13	S2	Not used
14	Vcc	3.3V power
15	S1	Not used
16	+5V	5V±20% power supply

## General Operation

After power has been applied to the circuit, data will be streamed from J4 & J3. This will appear as follows:

Bit	7	6	5	4	3	2	1	0
Data	1	T	X9	X8	X7	Y9	Y8	Y7
Data	0	X6	X5	X7	X3	X2	X1	X0
Data	0	Y6	Y5	Y4	Y3	Y2	Y1	Y0

T = 0 for release data touch mode

T = 1 for press data touch mode

## Example

With the device in continuous touch mode the reading looks like:

```
11 x9x8x7y9y8y7
0x6x5x4x3x2x1x0
0y6y5y4y3y2y1y0
```

In press only touch mode and release only touch mode:

```
11 x9x8x7y9y8y7
0x6x5x4x3x2x1x0
0y7y5y4y3y2y1y0
10 x9x8x7y9y8y7
```



loops round

stop

for touch and release points respectively.

## Set up commands

As standard the device is shipped pre-configured as follows:-

BAUD RATE – 2400 baud, no parity, 8 data bits, 1 stop bit  
 TOUCH MODE – Continuous data stream  
 AVERAGING – 32 samples per reading  
 SPEED – Auto switching off  
 NOISE REJECT - High noise rejection

Command	D7 -----D0	Hex	
BAUD RATE	0 1 0 0 0 1 0 0	44	2400 baud rate
	0 1 0 0 1 1 0 0	4B	9600 baud rate
FILTERING	0 0 0 0 0 0 0 0	00	4 samples per reading
	0 0 0 0 0 0 0 1	01	8 " " "
	0 0 0 0 0 0 1 0	02	16 " " "
	0 0 0 0 0 0 1 1	03	32 " " "
TOUCH MODE	0 1 0 0 0 0 0 1	41	Data sent on release
	0 1 0 0 0 0 1 0	42	Data sent on press
	0 1 0 0 0 0 1 1	43	Data sent continuously
AUTO SPEED SENSE	0 0 0 0 0 5 0 0	04	Enable auto speed switch
NOISE REJECTION	0 0 N 0 0 0 0 0	20	High noise rejection

## Example Programming

To modify any of the parameters in the setup the DTSC01 will respond to the following header code (01H). This will hold the controller in a command receive mode for approximately 100mS. If no further data is received within this period then the device will touch out and return to normal operation.

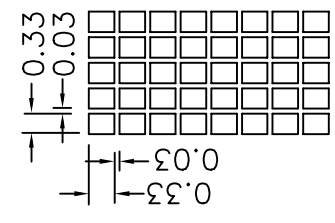
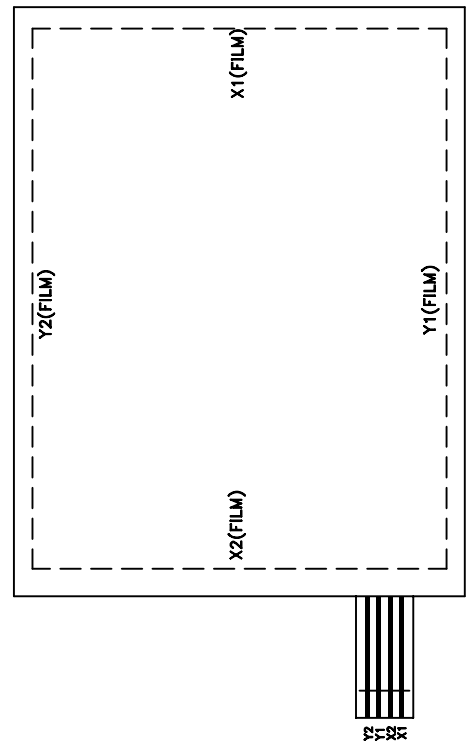
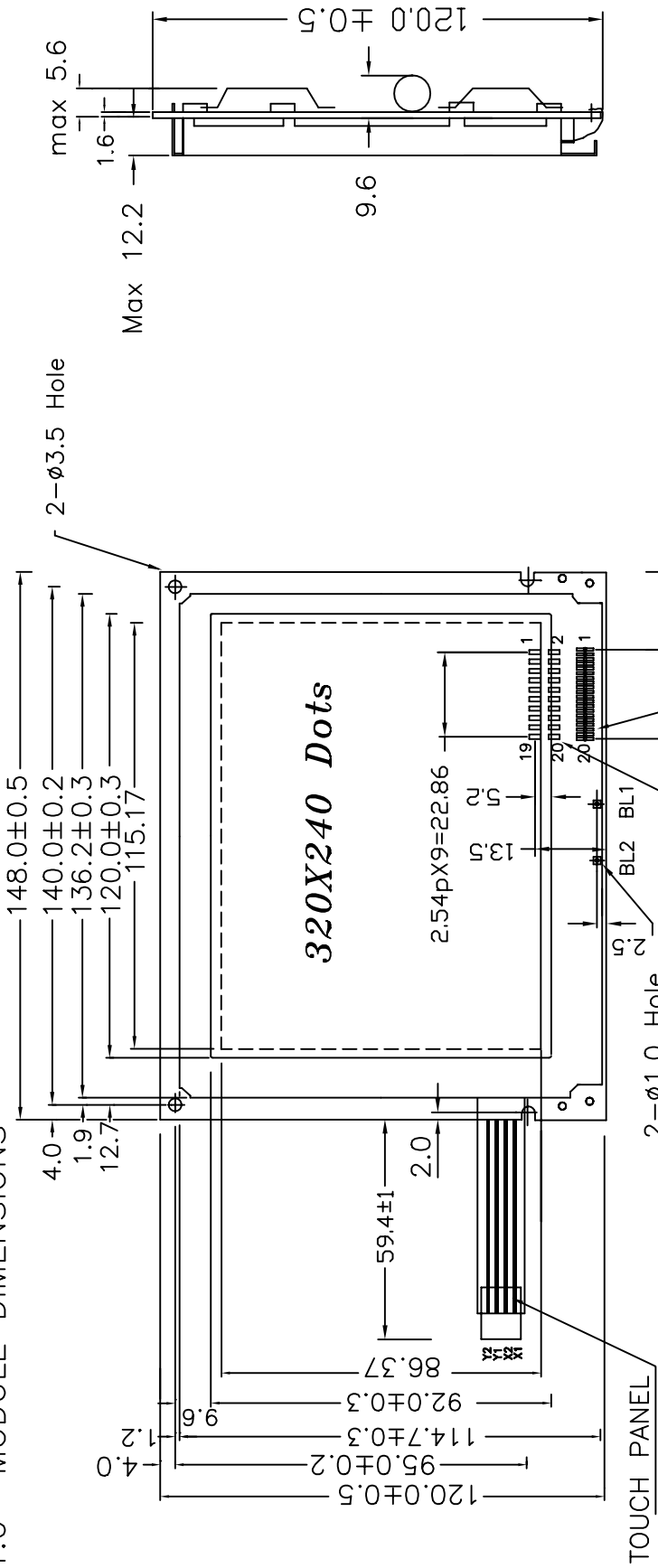
All commands must be terminated with ODH, after which the device will return to normal operation.

EG: To change the DTSC01 baud rate to 9600 (from factory set 2400) 01 4B OD

Note: To help with timing data write information, the DTSC01 will echo all information back to the host.



# 11.0 MODULE DIMENSIONS



## 12.0 PART NUMBER DESCRIPTION FOR AVAILABLE OPTIONS

# TS4733 ① ② 240G320 ③ ④ ⑤

①

### POLARIZER TYPE

B = Transflective: light background with LED backlight  
E = Transmissive: dark background with LED backlight

②

### BACKLIGHT COLOR

G = Yellow-Green (Standard)

③

### FLUID TYPE AND POWER SUPPLY

D = NTN with +5VDC and external negative voltage operation  
S = NTN with +5VDC operation (on-board negative voltage generation)  
H = NTN-H with +5VDC and external negative voltage operation  
W = Wide temperture range: on-board negative voltage generator

④

### FLUID TYPE

F = FSTN (Film Supertwisted Nematic)  
C = NTN with on-board temperature compensation circuitry  
N = NTN (Supertwisted Nematic)

⑤

### COLOR FOR NTN FLUID

B = Blue background  
G = Gray background  
Y = Yellow background