

# 5-Wire Resistive Touchscreens

## The Most Pillow-Resistant Touch Panel in the Industry

### Panels Suitable for:

- POS
- Kiosk
- Industrial
- Marine
- Military
- Aerospace

### Mechanical Specifications:

#### **Construction**

- 5-wire resistive technology (top sheet overlay)
- Not vented on standard units

#### **Cable and Connector**

- 5 conductors: Copper/polyimide
- Cable exit – left or right depending on discrete wire pinning of connector
- Termination – standard 0.1" x 5 position
- Tail bend resistance – tail can be folded

#### **Positional Accuracy**

- Greater than 99% accurate
- Less than  $\pm 1.5\%$  max deviation
- Touch point resolution (based on touch controller used)
- With WEDC controller, resolution 4096 x 4096 (12 bit A/D used)
- Greater than 3000 points across X and Y axis

#### **Touch Activation Force**

- Finger: 50 grams typical
- Stylus: 25 grams typical
- 3H pencil hardness (per ASTM 3363)
- Surface durability (per ASTM D1044)
- Meets taber abrasion test (ASTM D1044), CS-10F wheel, 500 grams



#### **Expected Life Performance**

- Greater than 35 million touches in one location
- Switch travel
  - Minimum 0.0010" (0.025mm)
  - Nominally 0.0035" (0.089mm) (flat top sheet)
  - Maximum 0.0050" (0.027mm)

### Visual Specifications:

#### **Available Cover Sheets**

- Anti-Newton Ring, antiglare (standard pen entry film)

#### **Light Transmission (per ASTM D1003)**

- 80%  $\pm$  5% at 550-nm wavelength (center of visible light spectrum)

#### **Haze (per ASTM D1003)**

- Less than 10%

#### **Gloss (per ASTM D2457)**

- 90 gloss units, typical

For more information, visit our website at [www.whiteedc.com](http://www.whiteedc.com) or call 614-279-6326 and ask for product sales.



WHITE ELECTRONIC DESIGNS

---

---

---

---

---

---

## Electrical Specifications:

### **Electrostatic Discharge Protection** (per EN 61 000-4-2. 1995)

- Meets Level 4 (15 kV air/8 kV contact discharges)

### **Contact Bounce**

- Dependent on contact pressure – with average finger pressure, touch can be resolved in less than 1mS with Cheetah® controller and ATAC circuitry

### **Open Circuit Resistance**

- Greater than 20M ohms, when measured from the signal contact (pin 3) to any drive contact (pins 1, 2, 4 or 5) on the connector, with no force applied to the active surface

### **Closed Circuit Resistance**

- Less than 3000 ohms between the signal contact (pin 3) to any drive contact (pins 1, 2, 4 or 5) on the connector with touch actuation anywhere within the active area

### **MTBF**

- WEDC touchscreens have a calculated MTBF of more than 200,000 hours based on returns data and hours of usage. Method is:
  1. The current probability of survival is 0.99 (definition of reliability, R)
  2. The typical usage rate for 12 months in hours can be estimated as a “minimum”: 8-hours per day, 5-days per week or 2080 hours per year (t)
- Using the basic reliability formula:
  - $R = \exp -t/MTBF$
  - $0.99 = \exp -2080/MTBF$
  - Natural log, in (0.99) =  $-2080/MTBF$
  - $-0.0100533 = -2080/MTBF$
  - $MTBF = 206,897$  hours

---

## Environmental Specifications:

### **Temperature and Humidity Resistance**

- Operating (TS stays flat): -10°C to 60°C to 95%RH (Non-condensing)
- Operating: -10°C to 65°C to 95%RH (Non-condensing)
- Storage: -40°C to 75°C to 95%RH (Non-condensing)
- Short-Term Storage: -40°C to 100°C

### **Humidity Resistance**

- Operating: Cover sheet remains flat
- Storage: Cover sheet pillowing or ripples flatten when returned to operating temperatures

### **Thermal Cycling**

- Handles extreme thermal and humidity variations

### **Immersion**

- Not applicable for vented sensors
- Not affected by immersion when properly sealed

### **Water Spray**

- The touchscreen shall function normally and not be damaged by running water applied to the active area. The touch panel can be sealed to NEMA4X and NEMA12

### **Chemical Resistance**

Not affected by most processing chemicals and industrial solvents such as:

- Ketones
- Alcohols
- Aromatic and aliphatic solvents
- Etching acids and weak alkalis
- Water

### **Household Cleaners**

Excellent resistance to most common liquid household cleaners and foodstuffs such as:

- Topjob®
- Wisk®
- Ketchup
- Coffee

### **Altitude**

- Operating: The touchscreen is capable of operation at an altitude of 10,000 feet above sea level
- Storage: The touchscreen is capable of surviving storage, without damage, at an altitude of 50,000 feet above sea level

### **Vibration**

- The touchscreen shall not be damaged by being subjected to a vibration of 0.01” peak-to-peak excursion, at a frequency of 5 to 455 Hz, for a period of 15 minutes in each of three axes

---

---

---

---

# Cosmetic Specifications

## Surface Quality

Surface quality criteria identify cosmetic irregularities appearing on or between the glass and plastic surfaces of the touchscreen. WEDC surface quality criteria are consistent with the criteria used by the major LCD and display manufacturers. Cosmetic irregularities are normally categorized by the following:

- Circular criteria
- Linear criteria

### Circular Criteria

Circular criteria identify surface quality irregularities that are circular in nature. This includes dirt, particles, glass bubbles, digs, hard coat flaws, etc. Size will be measured across its diameter. Irregularly shaped circular defect diameters will be designated by the smallest diameter into which the defects could be completely contained, i.e., the length at the widest point of the defect.

#### Active Area:

- No defect larger than 0.020" is allowed
- No more than two defects in the range of 0.015" and 0.020" contained within a 2" diameter area
- The sum of the diameters of all circular defects contained within a 2" diameter area shall not exceed 0.050"

#### Viewable DSCA Area (double-sided cover sheet adhesive):

- No defect larger than 0.040" is allowed in the area 0.125" larger per side than the active area

#### Outside Viewable Area: N/A

### Linear Criteria

- Linear criteria are quality irregularities that are linear in nature. Linear defect size will be measured across the width of the defect at its widest point. Linear defects smaller than 0.002" will not be considered in the evaluation of cosmetic acceptability

#### Active Area:

- No defect having a width larger than 0.004" is allowed
- The maximum length of a single defect, with a width between 0.002" and 0.004", is 0.500 inches
- The combined length of multiple linear defects within a 2" diameter area shall not exceed the requirements listed in Table 1. The distance between two linear defects shall not be less than the separation defined in Table 1. When two linear defects are in different width categories, the largest width category shall be used to determine minimum separation

#### Maximum Length Minimum Separation (Table 1):

0.500"	0.150"
1.000"	0.150"
1.500"	0.050"

#### Outside Active Area: N/A

## Inspection Method

Inspection shall be accomplished by looking through the touchscreen at an inspection light. The inspection light shall consist of U.S. standard cool white fluorescent, F2, lamps that are mounted 3" to 4" behind an acrylic diffuser, producing light energy of approximately 375 Lamberts. The outer surface of the inspection light shall be covered with equally spaced horizontal black stripes, approximately 2" wide, and covering roughly 50% of the light's outer surface. The element shall be held 6" to 12" from the face of the inspection light, and shall be viewed at a distance of 12 to 18 inches.

The touchscreen shall be moved slowly up and down while viewing all areas as they pass from light to dark then back to light. Inspection shall be performed using the unaided eye, excluding prescription eyeglasses or contact lens. Measurement of defect size may be aided by magnification.

### Cover Sheet Fit Criteria

- Proper Fit: Using a plastic straight edge diagonally across the entire surface of the cover sheet, check that the cover sheet is flat or slightly concave
- Excess Air Criteria: Excess air trapped under the cover sheet causing the cover sheet to be inflated is not acceptable
- Ripple Criteria: Ripples in the cover sheet material extending from the edge inward or any configuration are not acceptable
- Stroke Length Criteria: The required stroke excursion (distance from cover sheet to glass) to activate the touchscreen shall not exceed 0.005"

### Passable Criteria

The polyester cover sheet has a durable hard coat and antiglare coating on the outer surface, and conductive metallic coating on the inner surface. The combination of lighting conditions, inspection viewing angle, back may reveal additional defects that are inherent with the material and coatings. The following defects will pass if they fade in front of a light box:

- Stain
- Discoloration
- Infringement patterns (optical characteristic caused by fluorescent lights)
- Streaks
- Stress
- Scuffs

# Cheetah® 5-Wire Resistive Controller Specifications

## Operational Voltage:

- 3.3V (DSP, Touchscreen)

## Input Voltage:

- 3.8V to 16V on connector J2, USB bus 5V on connector J4

## Current Draw:

- 15mA (+25mA USB) average current in standard operating mode (No touch)
- 60mA (+25mA USB) typical current in standard operating mode (touch)
- 150mA (+25mA USB) peak current in standard operating mode (touch)
- 8mA current in sleep mode (touch wakes controller, no serial communication)

## Power Consumption:

- 55mW @ 3.6V (no touch)
  - 75mW @ 5V (no touch)
  - 300mW @ 5V (touch) typical
  - 750mW @ 5V (touch), 400mW dissipated across touch sensor during touch
  - +125mW if USB circuit is used
- Touchscreen characteristics contribute to overall power consumption*

## Operating Temperature:

- 0°C to +70°C Commercial
- -20°C to +80°C Industrial (available upon request)

## Storage Temperature:

- -40°C to +85°C

## Touch Response Speed:

- Touch response time (PEN): 1 to 2mS typical
  - Touch response time (FINGER): 1.5 to 3.5mS typical
- Touch response speed is measured from first touch contact to first serial bit toggle.*
- Touch activation force: less than 5 oz.*

## Touch Acquisition Speed:

- 800uS minimum contact required
- Touch acquisition speed is measured from first touch contact to the end of the sampling period.*
- Pen taps have been measured to less than 1mS.*

## Analog Conversions per Touch Coordinate:

- A/D = 312

## 16 Bit Math/Logic per Touch Coordinate:

- ADDS, SHIFT, DIV = 388
- CONFIDENCE TESTS = 16

## DSP Clock Speed:

- External = 8MHz
- Internal = 0 to 32Mhz

## MTBF:

- Per MIL-HDBK-217, notice 2 > 1M hours
- Report available on request*

## Static Discharge:

- RS-232 Bus Pin ESD
  - +/-15KV per the human body model
- Touch Pin ESD
  - ESD Rating of Class N (exceeding 16 kV) per the human body model (24 Watts @ 1mS)
- Power Pin ESD
  - 2kV per the human body model

## Touch Coordinate Resolution:

- 13bit internal scaled depending on output format and calibration

## Diagnostics:

- Surface mount LED for power and touch

## Baud Rate (Serial RS232):

- 38,400 (WEDC mode default)
- 19,200
- 9,600 (MTS / Elo emulation)

## Touch Coordinates per Second:

- 146pps WEDC mode (53mA)
- 140pps MTS emulation mode (75mA)
- 72pps Elo emulation mode (68mA)
- Over 400pps available (custom mode)

## Command Set Emulation:

- ELO 2210
- MTS capacitive or resistive
- Other emulations available

## Footprint Dimensions:

- 2.1 inch (length) x 1.1 Inch (width) x 0.37 (height)
- 0.15 inch hole centers from edge of board

## WEDC and MTS Emulation Packet Format

Byte	Description
1	Status Byte
2	XLOW
3	XHIGH
4	YLOW
5	YHIGH

## Elo 2210 Emulation Packet Format

Byte	Description
1	ASCII 'U' (55h)
2	ASCII 'T' (54h)
3	Status Byte
4	XLOW
5	XHIGH
6	YLOW
7	YHIGH
8	ZLOW
9	ZHIGH
10	Chksum

For ordering or information on any of our products and services, call White Electronic Designs at:

539 Industrial Mile Road  
Columbus, OH 43228  
Tel: 614-279-6326 Fax: 614-279-0249  
www.whiteedc.com



WHITE ELECTRONIC DESIGNS

5-Wire Resistive Data Sheet  
IEDF012 Rev. 0 3/07