



COSMETIC & OPTICAL STANDARDS

CYBERTOUCH
QUALITY ASSURANCE DEPARTMENT
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1.0 SCOPE

This standard establishes the cosmetic acceptance criteria and inspection conditions for parts supplied by CyberTouch.

These criteria and conditions shall constitute both CyberTouch and the customer's acceptance standards unless otherwise specified by the customer's purchase agreement, and accepted by CyberTouch in writing.

2.0 PURPOSE

CyberTouch touch screen's cosmetic acceptance is usually determined by subjective visual examination; however, the ultimate decision on acceptability is its functional acceptance when viewed on the equipment.

The purpose of this specification is to establish correlating techniques using conventional viewing procedures available in the customer's incoming inspection department to verify the cosmetic acceptability of CyberTouch panels as they are viewed on the customer's equipment by the end user.

3.0 DESIGN AND COSMETIC CRITERIA – General Considerations

CyberTouch panels are hard-coated to add increased protection from abrasion and chemical deterioration and enhance the viewing of data when placed in front of the information displays. The coating should not exhibit window imperfections that would impair the readability of the display or which become distracting to the user.

Users may find that a part is a cosmetically acceptable part even though minor flaws are sometimes discernible. A judgment must be made as to whether or not the end user would consider the flaws objectionable, while using the specified criteria and inspection conditions available.

If a part reveals flaws using the specified criteria and viewing condition but an accept/reject decision is difficult to make, the part will be accepted.

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These parts are often cosmetically acceptable even though one or more of the maximum allowable flaw guidelines might be exceeded. However, if more criteria are desired, the flaw guidelines in section 6.0 inclusive through 7.3.4 may be referenced.

A repetitive cosmetic flaw that occurs in the same location will be more easily noticed. If a flaw was judged to be acceptable at the beginning of the inspection, the repetitive flaw shall also be acceptable at the end.

The bulk of cosmetic inspection time should be used in the viewing and accepting of the item. Flaws seldom need to be measured or counted.

4.0 SURFACE UNIFORMITY

There shall be no evidence of gross defects such as gouges, discoloration, dark areas, streaks, or non-uniform coating when viewed as in Section 5.3 and 5.3.2 and ONLY WHEN ACCEPTED BY CYBERTOUCH IN WRITING, Section 5.3.3.

It should be noted that certain defects are acceptable by the criteria of Section 6.0 inclusive through 7.3, but no surface may be of such obvious poor quality as to downgrade the end product.

5.0 TESTING AND VIEWING PROCEDURES

5.1 GLOSS MEASUREMENT

5.1.1 GLOSS LEVELS AND TOLERANCE: Gloss levels of coated surface should be established and specified separately for each part number.

The typical values and tolerance along with the corresponding ranges are listed below.

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<u>Gloss</u>	<u>Tolerance</u>	<u>Range</u>
10	± 3	07-13
32	± 6	26-38
54	± 6	48-60
75	± 6	69-81

5.1.2 GLOSS SPECIFICATION: The gloss level shall be specified and tested in accordance with ASTM Method D-523 "Test for Specular Gloss."

5.2 RESOLUTION EVALUATION

5.2.1 SPECIFICATION: Resolution shall be tested using a backlit U.S. Air Force resolving power test target, type 1951, in accordance with the U.S. Department of Transportation Federal Aviation Administration Specification FAA-E-2481 (section 3.14.1: Surface Etch, and figure III: resolution Chart Data)

5.2.2 THEORY: The USAF chart consists of a stepped series of three clear bar patterns (elements) arranged together (groups) in an orderly sequence on an opaque background. All elements should be discernible on the target that is judged acceptable.

5.2.3 MINIMUM VALUES: The threshold resolution observed through the coated part (using clear material) is acceptable when the resolution meets the minimum values specified in section 5.2.6 below.

5.2.4 GLOSS vs RESOLUTION: Due to the relationship of a gloss to resolution (higher gloss = higher resolution), if the gloss of a coated part as measured is within the specified limits of section 5.1, the resolution has no maximum value.

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5.2.5 INSPECTOR LIMITATIONS: The inspector must be able to distinguish separate bars in at least group +3:1 corresponding to 8.00 line pairs/millimeter, through the uncoated substrate, or resolution will be limited by the inspector's visual acuity.

5.2.6 MINIMUM RESOLUTION VALUES TABLE

<u>GLOSS</u>	<u>LINES PAIRS/MM</u>	<u>GROUP : ELEMENT</u>
10	0.25	-2:1
32	1.00	+0:1
54	5.04	+2:3
75	6.39	+2:5

5.3 SURFACE COATING QUALITY

5.3.1 VIEWING PROCEDURES (Substrate and Coating): The part is acceptable if the eye is not distracted or drawn to a flaw under the viewing conditions specified in section 5.3.2 and only when acceptable in writing by CyberTouch, section 5.3.3.

If attention is drawn to a flaw, the part is then evaluated against the criteria in sections 6.0 inclusive through 7.3.

If a visual accept/reject decision requires more than 8 seconds to make, the part shall be accepted.

NOTE: (Be sure "flaw" is not a readily removable surface contaminant).

5.3.2 TRANSMITTED LIGHT VIEWING PROCEDURE

5.3.2.1 NORMAL VIEWING PROCEDURE: The coated surface of the substrate shall be inspected for apparent blemishes at eye level and placed in an attitude characteristic of the part's position at final assembly or during end use (vertical unless otherwise agreed).

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5.3.2.2 DISTANCE AND BACKGROUND: Inspect at a distance 1.5 times the longest diagonal measurement of the part against a light- and/or dark colored background located at least 10" behind the part to assure adequate reflected light from the background.

5.3.2.3 DURATION AND ILLUMINATION: Inspect the part for no longer than 8 seconds under the diffused illumination of 80 to 120 foot candles of non-directional overhead inspection lighting.

NOTE: (Cosmetic inspection should never be performed by viewing through the part directly at a light source or closer than 18").

5.3.3 REFLECTED LIGHT VIEWING PROCEDURE

5.3.3.1 SPECIAL NOTE: Section 5.3.3 of this procedure is to be used only when specified by the customer's purchase agreement and accepted by CyberTouch in writing and priced accordingly.

5.3.3.2 THEORY: The coated surface may be tilted or moved about in an effort to reflect the overhead source of illumination during this inspection procedure.

5.3.3.3 METHOD: The part shall be at some angle (45 degrees unless otherwise agreed) rather than at eye level in order to reflect the light. When this is done, the inspector's head should be tilted to provide the same perpendicular attitude to the part as mentioned in section 5.3.2.

5.3.3.4 MISCELLANEOUS: All other conditions of section 5.3.2 apply unless specified by the customer's purchase agreement and accepted by CyberTouch in writing.

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6.0 SUBSTRATE QUALITY

6.1 INCLUSIONS

6.1.1 VARIATIONS: While most engineering plastic substrate are of very good quality, variation in the cosmetic acceptability is influenced by the choice of resin (some process cleaner than others); the thickness of film, sheet, or molded part; the cleanliness of the processing equipment, e.g., extruder, calendar, injection mold, etc; and the control of the process itself.

6.1.2 RESULTING COSMETIC CRITERIA MODIFICATION: As a result, if the cosmetic sales specification using the designated substrate source presents unusual problems in achieving acceptable cosmetic levels at CyberTouch, then the values within Section 7.3 will be modified accordingly.

6.2 SCRATCHES

6.2.1 ON SUPPLIED ITEMS: Supplied film, sheet, and molded parts infrequently may exhibit surface scratches. If incoming inspection at CyberTouch is required, CyberTouch will evaluate the supplied item per Section 7.1 or otherwise mutually agreed upon criteria.

7.0 COATING QUALITY

7.1 ACCEPTABLE SCRATCHES

7.1.1 DEFINITION: All defects long and thin in nature constitute a family referred to as "scratch-type defects". This family includes such defects as a scratch, lint, string, crack, and fracture.

7.1.2 SPECIFICATIONS: Any defects having a length-to-width ratio greater than 6:1 are classified in this family

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7.1.3 SCRATCHES AS FILLED IN BY COATING: Scratches are normally associated with the substrate and the coating. To a limited extent, scratches (depending on the width, depth, and angle of cut) are filled in by the hard coating.

7.1.4 SCRATCHES $< 0.003"$: Scratches with a width that is less than $0.003"$ shall be accepted regardless of accumulated length.

7.1.5 SCRATCHES $\geq 0.003"$ TO $< 0.005"$: Scratches with a width greater than or equal to $0.003"$ but less than $0.005"$ are acceptable provided the total accumulated length is $2"$ or less per part or per square foot, whichever is smaller.

7.1.6 SCRATCHES $\geq 0.005"$ TO $< 0.010"$: Scratches with a width greater than or equal to $0.005"$ but less than $0.010"$ are acceptable provided the total accumulated length is $0.50"$ or more per part or per square foot, whichever is smaller.

7.2 ACCEPTABLE INCLUSIONS

7.2.1 DEFINITION AND SPECIFICATION: All coating defects that are round in nature constitute a family referred to as "inclusion-type defects". This family includes such defects as pinholes, gels, voids, bubbles, seeds, and foreign materials. Any defects with a length to width ratio of 6:1 or less are classified in this family.

7.2.2 INCLUSIONS $< .010"$: Inclusions less than $0.010"$ in diameter may be unlimited in number provided they do not form a cluster or haze.

7.2.3 INSPECITON AREAS: Acceptable quantities in Section 7.3 are for each part of per square foot, whichever is smaller.

Classifications should be established and specified separately for each part number.

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7.3 COSMETIC QUALITY CLASSIFICATIONS

- 7.3.1 CLASS C: Minimum cosmetic acceptance criteria offering the highest production rate and yield and suitable for most glazing applications, signs, and less critical molded parts.
- 7.3.2 CLASS B: Generally suitable for a wide range of applications including optoelectronic displays.
- 7.3.3 CLASS A: Reserved for the most critical optoelectronic displays demanding optimum coating and substrate performance causing lowest production rate and yield.

<u>Quantity</u>			<u>Dimension</u>	<u>Minimum Separation</u>
<u>Acceptable</u>				
<u>"Class"</u>				
A	B	C		
0	0	0	>0.030"	N/A
1	4	7	0.021"-0.030"	1/2"
3	6	9	0.018"-0.020"	1/4"
5	8	11	0.015"-0.017"	1/8"
7	10	13	0.011"-0.014"	1/8"
Unlimited			≤0.010"	N/A

8.0 REFERENCE DOCUMENTS

8.1 APPLICABLE DOCUMENTS

- 8.1.1 MISCELLANEOUS: The following documents form a part of this specification to the extent specified herein.
- 8.1.2 ASTM GLOSS MEASUREMENT METHOD: ASTM Method D-523 "Test for Specular Gloss."
- 8.1.3 RESOLUTION SPECIFICATION: FAA-E-2481 Department of Transportation – Federal Aviation Administration Specification (3.14 "Etch Characteristics of the Implosion Panel").