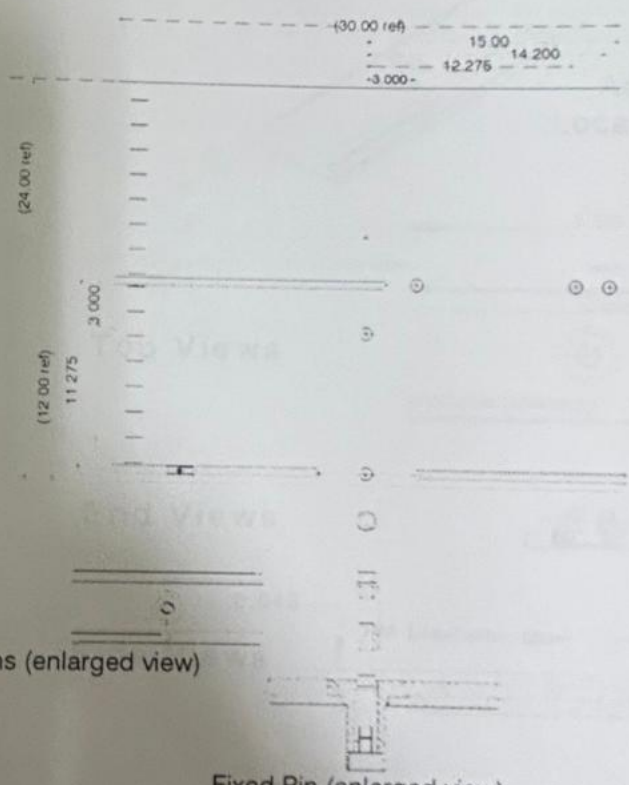


Adjustable Pins (enlarged view)

Fixed Pin (enlarged view)

Standards Compliance

FCC	Class A digital device as defined by Part 15 of the FCC Rules
EMI	Class A digital device as defined by the Radio Interference Regulations of the Canadian Department of Communications
CE	Council Directive 89/336/EEC, standards EB55022 and EN 50082-1, and Council Directive 73/23/EEC, standards EN 50116 and EN 60950

Environmental Requirements

Proper temperature, humidity, and room cleanliness are extremely important to the proper functioning of the Crescent/30 or 40 and Escort 30. This section defines these requirements.

Requirements

Temperature and humidity

Operating range:

- 60° - 80° F (16° - 26° C)
- 40 - 60% (non-condensing) humidity

Requirements for achieving accuracy specifications*:

- 68° ± 1°F (20° ± 0.5°C)
- 50% ±5 % humidity

*Accuracy and repeatability specifications are achieved only under these environmental conditions and when imaging on film.

Air Supply

Note: Air is required only for the Escort/30 Auto Film Loader.

- 85 psi (5.9 kg/cm^2 [6.03 bar]) per minute
- 5µ filter
- 5 CFM (142 l/minute)

Note: The air supply must be free of all contaminating fluids, oil, and water, whether liquid or vapor.

The Purchaser must provide an air supply line with a 1/4" (6.3 mm) inside diameter. The following connector is supplied with the Escort/30 to connect it to the air supply line:

Nipple, quick disconnect, 1/4 - 18NPT Parker #20-3BP

Note: Shop air may be used to fill the air reservoirs for the air bladders. If shop air is not available on site, an air compressor will be shipped with the imager to be used to fill the air bladder reservoirs.

Workstation

- ACCU-MATCH² includes a 2310 workstation (dual 400 MHz CPUs, 256 MB RAM, 4 GB disk, 21" monitor, network adapters for 10/100Base T and thick/thin LAN).
- ACCU-MATCH² includes a single UCAM AOI license which can run on the included workstation or on customer-supplied UCAM-approved computer.

Installation Requirements

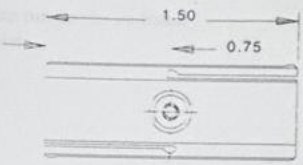
Environmental 60 - 80°F (16 - 26°C); 40 - 60% (non-condensing) relative humidity.

Electrical 120 VAC, 50/60Hz, 20 amp dedicated circuit; 12 amp peak draw; 9 amp average operating draw; 1080 watts average power consumption. A 1 KVA transformer included with the ACCU-MATCH² accepts 100, 115, 200, or 230 VAC input and provides the required output.

Heat 3,700 Btu/hr.

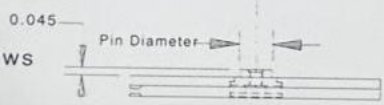
Width		Depth		Height		Weight		Heat	Power	
inches	mm	inches	mm	inches	mm	lbs.	Kg	Btu	watts	amps
45	1143	72	1,830	53	1,346	750	340	3,700	1,080	12

T-Slot
Adjustable
Locating Pins



Top Views

End Views



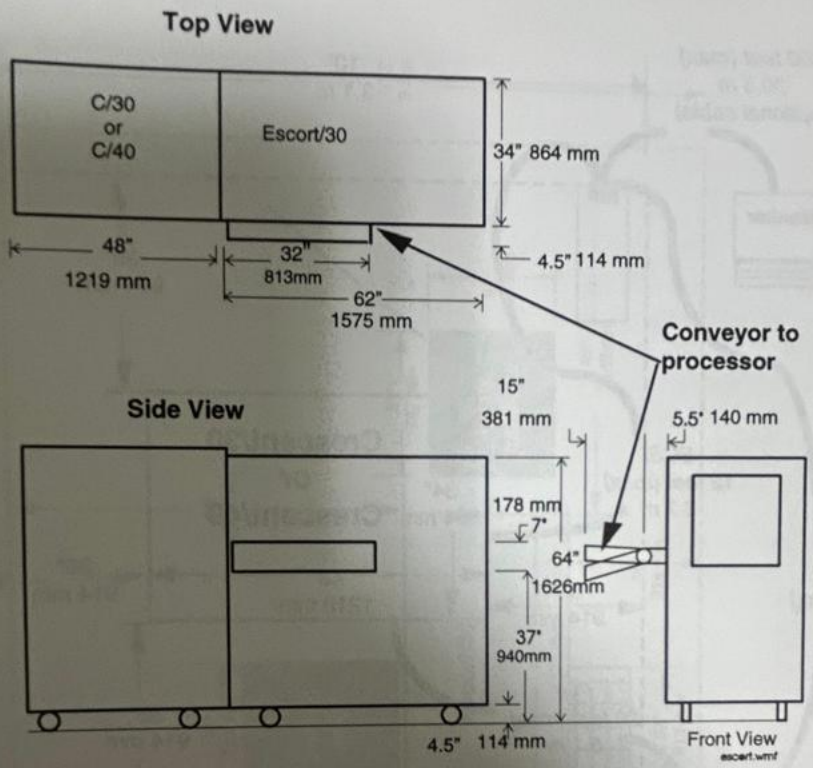
Side Views

Table 1 Tooling Pin Diameters

Diameter	
inch	mm
0.2497	6.34
0.2348	5.96
0.1965	5.00
0.1872	4.75
0.1574	4.00
0.1247	3.17
0.1220	3.10
0.1181	3.00

The information provided above is subject to change without notice

Crescent\30 or 40 and Escort/30 Elevations



Electrical Requirements

CAUTION: Barco-Gerber Systems exercises strict design control over the electrical requirements of its systems. Electrical service that does not meet the stated requirements can seriously affect the performance and reliability of the systems and may, in some cases, cause damage to the electronics. There are no short cuts to meeting the electrical requirements.

	Crescent/30 or Crescent/40	Escort/30	PRISM-NT Workstation
Power	120 VAC ±10% 50/60 Hz ±0.5%	120 VAC ±10% 50/60 Hz ±0.5%	120 VAC ±10% 50/60 Hz ±0.5%
Service	20 amp dedicated (2 wire plus ground)[1]	20 amp dedicated (2 wire plus ground)[1]	20 amp dedicated (2 wire plus ground)[1]
Peak Current	6 amps	4 amps	5 amps
Average Operating Current	4 amps	2.5 amps	4 amps
Average Power Consumption	480 watts	300 watts	480 watts

[1] An uninterruptible safety earth ground connection of no more than 1Ω impedance should be provided to the system.

Transformer

- A 1 KVA transformer is supplied, which proides the required input voltage.

Crescent/30 or 40 Heat exhaust location

REAR VIEW

D-C3002.WPG

Network Integration

The ACCU-MATCH² is Solaris-based and can be integrated into existing networks based on UNIX workstations.

The purchaser is responsible for :

- Installing network cable to the workstation
- Providing network hardware and/or software required to complete installation
- Providing network addresses as required.
- Providing network personnel to support installation.

Integration into any configuration other than those listed here is the responsibility of the Purchaser.

Table 3 Etched Copper Inspection

Copper Treatment	Substrate Thickness	Rating	Specular %/Diffuse % (Threshold)
Mech. Scrubbed Copper	.027	++	50/50 (75)
Chem. Cleaned Copper	.027	++	50/50 (80)
Double Treat (Gould)	.014	+	100/0 (120)
Reverse Treat (Oak Mitsui MLS)	.021	++	100/0 (120)
Double Treat (Oak Mitsui MLS-DT)	.006	++	100/0 (115)
Polyclad DSTF	.008	++	100/0 (145)

Table 4 Photoresist over Copper

Copper Treatment	Substrate Thickness	Rating	Specular %/Diffuse % (Threshold)
Mech. Scrubbed Copper	*	++	30/70 (115)
Chem. Cleaned Copper	*	++	30/70 (120)
Double Treat (Gould)	*	++	30/70 (105)
Double Treat (Oak-Mitsui MLS)	*	++	30/70 (120)
Double Treat (Circuit Foil)	*	+	0/100 (60)
Polyclad DSTF	*	++	30/70 (110)

*Note: Various blue/green resists from several manufacturers were used in the tests.

Material	Filter	Rating	Specular %/Diffuse % (Threshold)
Novaclad	Heat Glass/1000nm	+	70/30 (125)
DuPont AP-9121	Standard 700nm/1000nm	+	70/30 (125)

A Note on Testing Materials

The testing was performed on several varieties of phototools, etched copper layers, and photoresist over copper layers. The following procedure should be used to test each material:

1. Build a CAD database with inspection tolerances of ± 2 mils on features at or below 8 mils in size and ± 3 mils on features above 8 mils in size. Include an appropriate etch factor if required.
2. Measure the panel thickness and set the focus height accordingly.
3. Find the lighting balance (specular/diffuse) that maximizes the contrast between circuitry and background.
4. Calibrate the material.
5. Measure a feature width and set the threshold to accurately represent that feature width.
6. Inspect the panel and record the results.

Some of the panels were "seeded" with defects and others included defects induced by the fabrication process or through handling. The system reliably found all defects down to 1 mil in size. A "Minimum Defect Size" of 2 square mils and a "Threshold Margin" of 0 allowed the reliable detection of these small defects.

Options

ACCU-MATCH²HS High Speed Option

Inspection Area	Resolution	Speed
22" x 26.5"	0.50 X 0.50 mil	7.5 ft²/min. (0.70m²/min)

Total panel scan time includes some overhead and possibly time for panel stretch/shrink adjustment.

ACCU-MATCH²HR High Resolution Option

ACCU-MATCH²- HR provides two inspection area/resolution/speed combinations:

Inspection Area	Resolution	Speed
22" x 27.5"	0.25 X 0.25 mil	1.875 ft²/min. (0.17m²/min)
22" x 26.5"	0.25 X 0.50 mil	3.75 ft²/min. (0.35m²/min)

Total panel scan time includes some overhead and possibly time for panel stretch/shrink adjustment.

DAT Drive

External SCSI DAT (digital audio tape) drive accepts 4 mm tapes and provides 5 GB storage.

Tooling Pins

Repeatability determines the reliability of inspection results and depends heavily upon consistent placement and orientation of panels being inspected. Standard pins are available in the sizes required by each stage of the process. In addition to the standard pins, both fixed and adjustable tooling pin options are available.

Fixed Tooling Pins

Fixed tooling pins are used to precisely locate the material to be inspected on the inspection table. They are precision round dowel pins placed in bushings that are permanently installed at known locations on the inspection table surface.

Adjustable Tooling Pins

Adjustable tooling pins are used to match the pinning requirements of any panel size. They are precision round "button" pins mounted in slides that are placed in any of the four slots machined into the inspection table surface. The position of the pin is established by moving the slide within its assigned slot and held in final position with a small set screw using an Allen wrench supplied with the system.

All platens are supplied with three filler slides (paper strips are optional) which may be placed in slots not occupied by adjustable pins to prevent unwanted reflection. The color of each filler slide matches that of the inspection table surface.

Overall Floor Space Requirements

Note: Floor space requirements do not include an online processor.

Standalone Crescent/30 or 40	Crescent/30 or 40 with Escort/30 and unload cassette
8'10" x10' (2.7 m x 3.1 m)	10'3" x 15'11" (3.3 m x 4.9 m)

Cables

Aside from the power cord, all cables are provided with the RIP or front end, not with the Crescent/30 or 40.

The PRISM-NT is supplied with a 15-foot (4.6 m) communication cable, 3 feet (914 mm) of which runs inside the Crescent cabinet. The PRISM-NT thus must be located within 12 feet (3.7 m) of the Crescent. See the floor plan diagrams on the next pages for additional information.

Optional cables are available to permit the PRISM-NT monitor, mouse and keyboard to be located up to 100 feet (30.5 m) from the computer tower.

Planning Guidelines

- A minimum **height** of 5'6" (168 cm) is required for all doorways and passages through which the Crescent/30 or 40 and Escort/30 must pass.
- A minimum **width** of 3' (92 cm) is required for all doorways and passages through which the Crescent/30 or 40 and Escort/30 must pass.
- A 3' (914 mm) clearance must be maintained on all sides of the Crescent/30 or 40. to permit access.
- If a Purchaser-supplied, inline processor is separated from the Crescent by a wall, the wall must be located so as to permit access to the conveyor from the Crescent side of the wall. See the dimensioned elevation drawings next.
- When using the unload cassette, a minimum of 61" (155 cm) clearance is required for removal from Escort/30.
- The operator of the Escort/30 will be required to handle the load and unload cassette assemblies. It is recommended that a four-wheel cart be available to transport these assemblies to and from the darkroom.
- A level, smooth floor surface is required and must be approved by Barco-Gerber Systems *prior to installation.*

two. Threshold margin defines a region on either side of the threshold value, which is the "margin". Any data seen as falling into this region (set of values) is considered "marginal" and is weighted accordingly.

While this can be used to eliminate false calls due to stains, increasing the threshold margin too high can begin to mask data, and can cause defects to be missed. It must therefore be used carefully.

Minimum Defect Size - With a pixel comparison system, each pixel in the scanned image is compared to the actual CAD data. Each pixel that is different from the CAD data is flagged. The Minimum Defect Size value allows the operator to set the number of square mils that must be different before this difference is flagged as an error. It therefore allows the system to be set as sensitive as needed.

As with each of these parameters, the setting is a trade off between finding what should be flagged, and increasing the number of "apparent errors" that must be verified.

Resolution - ACCU-MATCH² HS operates at 0.5 x 0.5 mil resolution. ACCU-MATCH² HR offers either 0.25 x 0.25 mil or 0.25 x 0.50 mil resolution.

Inspection Capabilities

This document can be used to assist in setting up the system for proper inspection. If unsure how to set up the AccuMatch for a new material, find the closest material in the list below and use the system settings provided as a starting point. These settings may not be optimal for your particular material. Process variation may dictate the use of a different combination of settings. Note that contrast on copper layers is impacted both by copper treatment and laminate structure.

The following outlines the materials tested, a performance rating, and the light balance and average threshold used. The rating system is...

- ++ Excellent inspection: excellent contrast, zero-few false alarms
- \+ Good inspection: good contrast, few false alarms
- \- Below average inspection: A higher contrast sample of this material may inspect well
- -- Poor inspection: poor contrast, excessive false alarms or escapes; other samples of this material may also inspect poorly

Table 2 Phototool Inspection

Material	Backing	Rating	Specular %/Diffuse % (Threshold)
Silver Halide	Reflective Foil	++	20/80 (111)
Silver Halide	White Paper	+	0/100 (89)
Diazo*	White Paper	-**	N/A

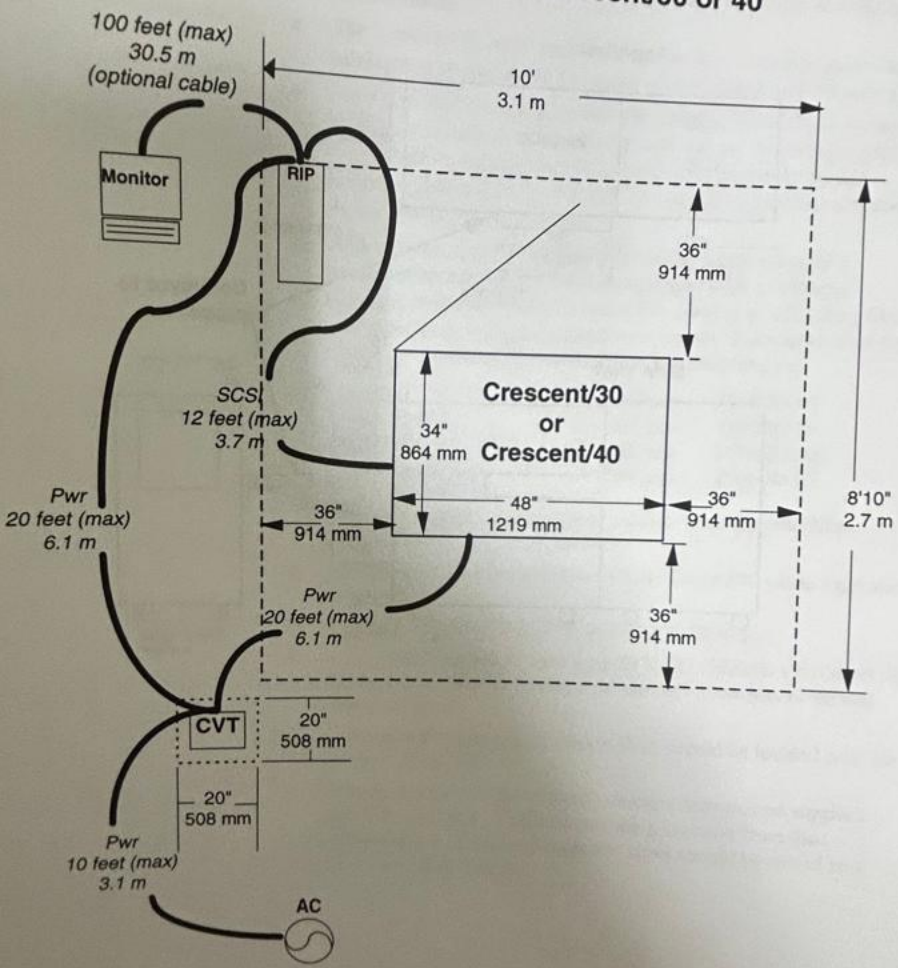
*Requires change of filters.
**Results depend on color of diazo and operator setup

- Do not use rugs, carpets, or carpet tiles, especially in the vicinity of magnetic devices and computers. Static electricity is harmful to these devices.
- The Crescent/30 or 40 must be operated in a room equipped with a safelight appropriate for the media when loading and unloading film.
- For Crescent/30 or 40 imagers used with the Escort/30, a separate light-safe darkroom to be used for loading and unloading media from the cassette is strongly recommended. The darkroom should accommodate a table for holding the cassette assemblies and media during loading and unloading.
- Although the Escort/30 is designed to operate in a daylight environment, the room should be equipped with a safelight appropriate for the media for use when loading or unloading film and when performing preventive or corrective maintenance on the system. Some examples of safelight requirements are:

Dupont IPCRL	Green/Cyan	T20/ND.75
Kodak ERF-7	Green/Cyan	T20/ND.75
Kodak SO411	Green/Cyan	T30/ND1.03
Agfa RLS3/HTR3	Green/Cyan	T20/ND.75

  Refer to the media manufacturer's instructions for your film selection safelight specifications.
- For servicing the Crescent/30 or 40 and Escort/30, white light should be provided.
- Emergency lighting should be provided in all rooms.
- A light table capable of viewing a 30"x 24" (762mm x 610mm) film should be available to facilitate on site measurements of service related images.
- A phone and/or phone jack (single line) should be located near the system's front end.
- Cabinets for the storage of media, documentation, and supplies should be provided. Cabinets provide protection from dust contamination. Disks and magnetic tapes should be stored in a controlled environment.

Floor Plan - Standalone Crescent/30 or 40



Heat Production

All heat is dissipated into the room.

Component	Btu/hr	Kcal/hr
Crescent/30 or 40	504	2,890
Escort/30	1,500	378
Workstation	480	121
Total	3,270	824

Planning Guidelines

Although a clean room environment is not required, cleanliness is extremely important to reliable system performance. The spinner mirror located in the imager is exposed to open air and can collect a significant amount of dust if particulate matter is in the air. In addition, dust settling on film will leave holes that will render images useless.

Please follow these guidelines in preparing the imager room.

1. If a processor is located in the same room as the imager, the gases produced by the processor must be vented out of the room. If not properly vented, processor gases will condense on the lens and other surfaces inside the imager and Escort 30, ruining exposures and causing premature equipment failure. If a vent/fan kit is available for the processor, it should be installed.

2. Discharges from the processor or any other machine must not empty into a sump inside the imager room. Emptying discharge within the imager room will introduce corrosive gases and raise humidity to unacceptable levels.

3. If the processor is connected directly to the Escort 30, the processor must be operated with negative air pressure to prevent fumes from entering the Crescent 30 and Escort 30.

4. The air flow from an air conditioning unit should not be directed at the system.

5. It is essential that filters used in the air conditioning system be cleaned and changed on a regular basis.

6. The imager room should have a solid surface floor, such as linoleum or concrete, that can be wet-mopped to control dust.

7. If the room has ceiling tiles, they should be of the type that will not flake and drop particulate matter.

Room Requirements

This section contains dimensions and other information that will permit you to plan the facility. Equipment and room dimension requirements are illustrated in this section.

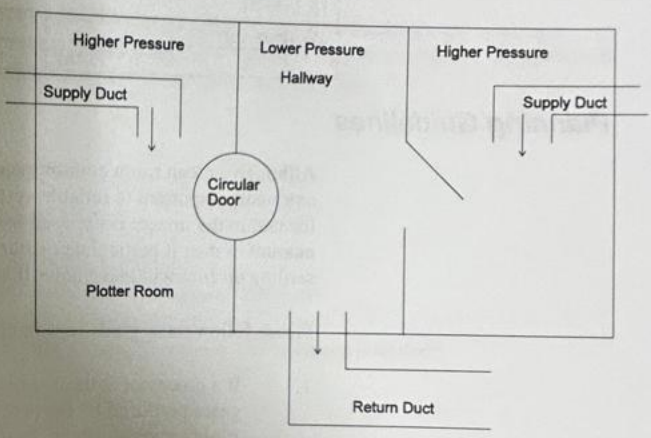
Equipment Dimensions

	Crescent/ 30 or 40 only	Crescent/30 or 40 with Escort/30	PRISM-NT Tower	PRISM-NT Monitor
Length	48" (1219 mm)	62" (1575 mm)	17" (432 mm)	16" (41 cm)
Width	34" (864 mm)	34" (864 mm)	8" (203 mm)	16" (41 cm)
Height	64" (1626 mm)	60" (1530 mm)	16" (406 mm)	18" (45 cm)
Weight	825 lb* (375 kg)	1225 lb** (556 kg)	20 lb (9 kg)	40 lb (18 kg)

*Distributed evenly on four casters.
**Distributed evenly on eight casters.

	Load Cassette	Unload Cassette
Length	29" (734 mm)	37" (940 mm)
Width	23" (584 mm)	30.5" (775 mm)
Depth	14" (356 mm)	3.5" (89 mm)
Weight (empty)	30 lb (14 kg)	40 lb (18 kg)

8. The easiest way to keep a room clean is to prevent dust from entering the room by maintaining higher pressure in the imager room than in any nearby room. Put a lone supply duct in the imager room with the return duct in a neighboring room. This is extremely important if corrosive chemicals or particulate matter are in the air. If these contaminants are allowed to enter the imager room, over time permanent damage could result to the spinner assembly reflective surface.



Application Information

Inspection Parameter Settings

Inspection results obtained with ACCU-MATCH² are a combination of the manufacturing process and the inspection parameter settings. A number of user controlled settings customize the inspection criteria with the manufacturing process and material type. Optimum setup can result in low or no false calls and a zero-defect escape rate. The setup is a one-time operation.

Parameters Controlling Inspection Sensitivity

Etch Factor - Adjusts line widths on a processed panel to account for etch loss. Since the system works from CAD data, it is important that the etch factor is properly entered so that the CAD database matches the panel. Attention to this parameter allows the other parameters to control sensitivity of inspection.

Feature Tolerance - Each feature in the job may be toleranced differently to give the proper degree of control. It must be remembered that a tolerance of ±1 mil means that each side of the feature can vary by no more than 1/2 mil before it exceeds tolerances. This is very tight, and in most cases, exceeds the etching consistency that can be achieved in-process. The normal set up is a tolerance of 2 or 3 mils, otherwise false calls where this very tight tolerance was not met occur. If a particular job requires a 1 mil tolerance, it is typically only for a few fine line features, and the job can be set up accordingly.

Lighting/Threshold - The lighting must be adjusted to allow the system to properly see the material being inspected. This is done by varying the mix and intensity of the two light sources in the system. While this seems obvious, the system can also be adjusted to look at various parts of the topology of the board. Between lighting and threshold, the system can inspect either the top of a feature or near the bottom. If surface imperfections (e.g. dish downs) are to be detected, it should be adjusted for the top. But, this must be decided before hand, as the value used for the etch factor is a function of topology to be inspected.

Threshold is the one adjustment that may be changed daily. This can be used to compensate if copper finish changes slightly, but normally little or no adjustment is required.

Threshold margin - Threshold margin is a setting that can be used to ignore some surface conditions that cause differences in reflectivity. Water stains and tarnish may be seen as errors if the proper threshold margin is not set because they appear darker than the normal copper. Proper lighting and threshold can compensate for much of this problem, but some may still cause false errors. This can be further improved by threshold margin.

The camera used in the system actually sees 256 shades of gray. The more reflective a surface, the brighter it is seen by the camera, and a higher the number representing that color is given. Typical surfaces are not seen as one color, but as various shades of gray close to the same value. The threshold setting determines which shades of gray will be called black, and which will be called white. If threshold is set at 100, all colors less than 100 are seen as black, all above 100 are seen as white. For normal surface conditions, the threshold can be set to "see" the copper as white, and the laminate as black. Water stains and tarnish are seen as somewhere in between the

Specifications

Standard Features

The standard ACCU-MATCH² provides an inspection area of up to 22" x 27.5" (559 mm x 699 mm), depending on whether the HS or HR option is selected. It can inspect panels or artwork up to 24" x 30" (610 mm x 762 mm). Standard features include:

- Live Video feature
- Ink marking system with automatic ink capping
- Two fixed tooling pins
- Two adjustable tooling pins
- Two 600nm spectral filters
- Starter supply kit
- Single user license for UCAM AOI seat, Inspect, and Golden Board software
- Documentation
- Installation/checkout, operator training; parts, labor, and software warranty as described in contract.
- Includes workstation
- Network integration available at time and materials.

Media size	Maximum size 24" x 30" (610mm x 762mm) Thickness 0.004" to 0.250" (.1mm to 6.35mm) Maximum inspection area depends on option. See *Options*.
Inspection Media	Etched copper including reverse-treat and double-treat foil Photoresist over copper Silver-halide film
Resolution/Speed	Depends on option. See *Options*. **High Resolution Option:** Up to 9 sq. in. per second; up to 0.25 mil resolution **High Speed Option:** 18 sq. in. per second; 0.5 mil resolution
Defect Detection	Process-related defects: opens, shorts, mouse bits, pinholes, excess copper, dishdowns, excessive media distortion and line width variation CAD-related defects: missing or extra features, wrong aperture sizes, step-and-repeat errors and positional errors
Defect size	Minimum defect size is 0.001" depending on system setup, which is under operator control. Maximum defect size is unlimited.
Defect Review	Inkmarking for off-line review. Screen display for on-line review shows defects in red or green depending upon type. Live video displays on a 13" color monitor.
Input Data	Gerber RS274-D and RS274-X, Golden Board, Excellon 1, Excellon 2, and Sieb & Meyer 1000, 3000, and 5000 Drill Formats; Orbotech Image data, CSI-Autoplot, Barco DPF, and others.

Floor Plan - Crescent/30 or 40 with Escort/30