



Terms of Reference

Procurement of an Integrated Wet Process PCB Fabrication System for the Electronics Product Development Center

I. Rationale

The Electronics Product Development Center (EPDC) is a facility that includes hardware and software tools to design, develop, and test electronics products. It was established to strengthen the local electronics and semiconductor industries to conduct various activities related to product development and also to attract foreign investors seeking a conducive business environment with readily available infrastructure. One of the many services offered by EPDC is the fabrication of low volume printed circuit boards.

EPDC would like to increase the production capacity in terms of size of PCBs, number of layers, plated through hole material, choice of surface finishes, and allow other process options wanted by PCB fabrication customers.

The Advanced Science and Technology Institute (ASTI) with the help of its co-implementing agency, the Electronics Industries Association of the Philippines, Inc. (EIAPI), aims to advance the PCB Prototyping capability through the Project 2 of the EPDC as Platform for Innovation and Collaboration (EPIC) Program.

II. Scope of Work

This purchase requisition is for the supply of a PCB fabrication system with photoresist, galvanic through hole plating (PTH), and green solder mask. The system shall also be capable of fine-line technology of industrial quality. In addition to this, the system shall have a recirculating wastewater treatment and surface finishing (ENIG). It should be an integrated system with machines designed, built, and supported by the manufacturer/s to work as one.

The PCB fabrication system should be setup as flexible as possible. Should the End User decide to upgrade the system in the near future, integration of new machines should conform to the current process that is in place, with minimal disruption.

The External Provider will supply the necessary support on the design and layout of the PCB fabrication system, on the desired equipment layouts, location of water and other utility lines to provide an efficient workflow consistent with the available space and structure of the EPDC building. The End User shall be the one involved in the coordination of services in the case of multiple bids and shall notify the External Provider accordingly for the setup and installation as well as commissioning.

The supplied equipment should comply with applicable and existing safety and quality standards that are implemented in the Philippines including but not limited to, ISO, RoHS, and IPC standards.

The Bidder must be able to provide machines for a wet PCB production setup. As the customer wishes to be assured that the equipment work together as one, and have operated safely and consistently through the years, we would like that the company supplying the equipment should have been in the PCB fabrication business by showing certified documentation of similar equipment or PCB fab installations for the past 20 years.

The Bidder should also provide documentation showing similar PCB fabrication installations, although the configurations may be slightly different, elsewhere in the local or international markets for at least five (5) installations in the last 5 years.

Bid price should be inclusive of all costs necessary (permits, taxes and duties, etc.) DDP. DDP will be based on the rules of Incoterms 2010.

The Bid shall be for the entire Lot (PCB Production System) or on individual units as shown in Annex A. It shall be equal to or better than the specifications listed in Annex A in order to fully comply with the specifications as stated. The equipment list is not exact and can be substituted for by better equipment with combined capability.

Progress Payment Terms:

1. Delivery of indicated equipment: Sixty (60) percent.
2. Installation, commissioning, user training, and acceptance: Forty (40) percent.

The Bidder who will comply with the Bid as one (1) lot, the End User shall require the External Provider to indicate the prices of each item individually (for future reference).

After Sales Service & Maintenance:

The External Provider (Principal) shall have a local service, with an office address based in the Philippines for diagnosis, maintenance or repair of the system components.

Warranty:

Warranty period shall be three (3) years. For the first year, labor and parts shall be covered by the External Provider. For years 2 and 3, only labor shall be free of charge. During the Warranty period, the External Provider upon proper notification of the End User shall send representatives within two (2) working days to verify and troubleshoot the issue. Experts shall arrive within seven (7) calendar days at the site where the defect(s) of Supplies is (are) found to repair or replace.

The External Provider will bear all expenses arising from this repair/replacement. In case the problem cannot be resolved on site, the External Provider must immediately notify the End User. External Provider shall notify the End User estimated time for repair/replacement but the period for repair/replacement shall not be longer than five (5) weeks from the dispatch date of the defective and/or damaged items (See Bid Docs).

All costs arising from or in connection with the repair and/or replacement, including but not limited to customs duties, taxes and transportation fees shall be borne by the External Provider. In case the items dispatched for repair/replacement cannot be returned within the stipulated time, the External Provider shall bear all costs arising from and/or in connection with this delay. The External Provider shall extend the warranty period in days, from the day the issue has been reported to the day the repair/replacement has been successfully made, after the verification of the issue.

Any replacement or repair provided under warranty period shall be warranted by the External Provider for at least another three (3) months on top of the remaining warranty period from the date of finishing repair and/or installation of replaced items. Extended warranty shall only cover the repaired part of the equipment.

III. Duties and Responsibilities of the Bidder

1. Supply equipment with the specifications equal to or better than as shown in ANNEX A.
2. Provide at least three (3) copies of the operations, and service manual/documentation for the system in printed (hard copy) and two copies of electronic or soft copy formats.
3. Provide free technical support, equipment, and service for the the duration of the warranty, and training and certification on maintenance and repair for all the machines listed in Annex A.

IV. Responsibilities of ASTI and EPDC Project Team

Reject any unit or any part thereof that fail to pass any test and/or inspection or do not conform to specifications.

V. Others

- **Customer concerns** shall have response within two (2) days upon receipt of notification. Expert Technical Assistance within one (1) week.

ANNEX A: PCB Production System, Wet Process

**PROCUREMENT OF AN INTEGRATED WET PROCESS PCB FABRICATION SYSTEM
FOR THE ELECTRONICS PRODUCT DEVELOPMENT CENTER
TERMS OF REFERENCE**

TOR_2020-02-04

- The PCB fabrication system should be supplied with all the necessary accessories including, but not limited to, power cables, user manuals, troubleshooting guides, quick-start guides, and schematics, and will operate in the EPDC operations environment with a 230VAC single phase supply except when explicitly indicated and agreed upon by the Buyer.
- With negative resist, galvanic through hole plating (PTH), green solder mask, and ENIG.
- Able to handle board size of up to 300 x 400 mm.
- Fine line resolution of 0.100 mm or better.
- Maximum capacity of not less than 3 sqm. per 8-hour shift.
- Wastewater filtration with drain water recirculation.
- Startup consumables for each machine.
- Year 1- free parts and labor warranty onsite support, training and certification on maintenance and repair for all machines.
- Years 2 and 3 - free labor.

Item	Description	Specifications	Quantity
1	PCB Board Cutter	<ul style="list-style-type: none"> • Ability to cut PCBs up to 3.0 mm in thickness or aluminum up to 1.5 mm. If desired, cutting of steel sheets up to 1 mm or plastic up to 5 mm is possible as well as cutting of film sheet material or paper. • Cutting width of 500 mm. • Angle and scale tolerance of 0.1 mm. • Adjustable cutting angle and clearance. • Cutting width max. 530 mm • Two blades made of hardened and ground steel • Spring loaded built-in clamping unit in the front (removable) • Bedstop with metric scale in the right front • Fully adjustable back stop with metric scale for batch work (0...300 mm) • Angle and scale tolerance 0.1 mm • Durable full steel construction • All important parts angular adjustable • Simple exchange of blades • Adjustable cutting angle • Adjustable clearance 	1

2	Brush Cleaning Equipment	<ul style="list-style-type: none"> • Oscillating brush with quick change system. • Adjustable brush oscillation frequency and transport speed. • Parallel height adjustment for the brushes. • Equipped with finishing brushes. • Full scale squeeze-off and hot air drying compartment. • Working width: 300 mm • Board thickness (rigid boards only): 0.3 - 5mm • Board sizes max.: 300 mm x endless • Brushing speed: 1360 rpm • Conveyor speed: 0.2 - 2 m/min • Oscillation stroke: 10 mm • Oscillation frequency: 10 - 110 l/min • Rinsing system water consumption: 6.8 l/min. • Power supply: 220 - 240 V~, 50 - 60 Hz, 1P • Includes a closed loop water management with filtration. • Bench top mounted with option to refit as freestanding. 	1
---	---------------------------------	--	---

3	CNC-drilling and Contour Routing Equipment	<ul style="list-style-type: none"> • This is a computer controlled drilling machine with Automatic Tool Change (ATC). • Allows direct processing of Excellon / Sieb & Meyer drill data or HP/GL route data for producing PCBs (drilling, cut-out-routing, isolation milling) or routing/engraving plastics, aluminum and other metals. • With automatic 16-slot tool changer. • Can handle 19 inch rack boards • Integrated mechanical milling depth limiter and pressure foot. • 500-2000 watt vacuum cleaner + start adapter for vacuum cleaner. • Manual, USB serial adapter, set of Allen keys. • ATC air hose • Can handle 300 x 400 mm PCBs. • Tool change, can hold: at least 16 automatic / semi-automatic 99 tools. • Power supply: 220 - 240 V~, 50 - 60 Hz, 1P. + vacuum cleaner (1500W). • Range of RPM: 3,000 – 63,000 • Traveling speed: 1 – 9,000 mm/min • Software resolution: 0.00001mm (0.01µm) • Mechanical resolution: step resolution: Software selectable: 1 mil, ½ mil, ¼ mil (= 3,175 µm). • Tool diameter: 0.1 mm – 3,175 mm. • Position accuracy: 20 ppm (0.002%) over the entire workspace. • Maximum position speed per axis: 9000mm/min (=150 mm/s). • Maximum working speed per axis: 9000mm/min (=150 mm/s), individual setting on a per-tool basis, independent from position speed. • Drill speed: 5 holes/s (= 18.000 holes/h= 300 holes/min). • Includes full software/driver package support for drilling and milling. • Board fixation: span fixing, clamp fixing, reference pin system, stack processing possible. 	1
---	---	--	---

4	Through Hole Plating Machine	<ul style="list-style-type: none"> • Accommodate board size up to 300 x 400 mm. • DC gear motor with step-less variable stroke speed adjustment for bath agitation. • Treatment tank capacity: 20 l. • Galvanic copper tank capacity: 60 l. • Integrated air injection and stepless regulated rectifier for the galvanic plating tank. • Total of five (5) treatment tanks (cleaning, pre-dip, catalyst, intensifier, reserve tank) and a separate galvanic plating tank. • Two treatment tanks equipped with thermostatically controlled Teflon heater. • Heaters: 2 x 800 W. • Rectifier: 2 x 6 V, 80 A. • Power supply: 220 - 240 V~, 50 - 60 Hz, 1P 	1
5	Dry Film Laminator	<ul style="list-style-type: none"> • Easy and fast mounting of resist rollers of nearly all coil diameters. • Detachable inlet table for easy access to low resist roll. • Adjustable laminating speed. • Electrically heated lamination rollers with uniform temperature distribution. • Separate transport rollers for non-creasing laminate transport. • Digital setting and read out of lamination temperature. • Manually adjustable lamination pressure for all common dry film resists with 3 and 5 inch core diameter. • Suitable for solder mask application. • Lamination width max.: 400 mm • Transport width max.: 440 mm • Board thickness: 0.3 – 5 mm • Board size: Min 50 x 50mm; max. 450mm x endless • Lamination speed: Adjustable • Resist tension: Adjustable • Lamination pressure: 0.2-1.2 m/min adjustable • Roller temperature: Adjustable • Temperature range: 20-120 °C • Power supply: 220 - 240 V~, 50 - 60 Hz, 1P 	1

6	PCB Developing Machine	<ul style="list-style-type: none"> • Maximum capacity of not less than 3 m² per 8-hour shift. • Maximum board size of 300 x 400 mm. • Line resolution of 0.100 mm or better. • Magnetic centrifugal pump for developer circulation. • Transparent lid with safety switch. • Removable board holder with locking position for drip-off. • Integrated rinsing zone with drip-off holder. • Maintenance free design with self-cleaning nozzles and magnetic pump. • In-built 1000W quartz heater. • Power supply: 220 - 240 V~, 50-60 Hz, 1P 	1
7	PCB Etching Machine	<ul style="list-style-type: none"> • Maximum capacity of not less than 3 m² per 8-hour shift. • Maximum board size of 300 x 400 mm. • Line resolution of 0.100 mm or better. • Magnetic centrifugal pump for developer circulation. • Transparent lid with safety switch. • Removable board holder with locking position for drip-off. • Integrated rinsing zone with drip-off holder. • Maintenance free design with self-cleaning nozzles and magnetic pump. • In-built 1000W quartz heater. • Power supply: 220 - 240 V~, 50-60 Hz, 1P 	1
8	PCB Stripping Machine	<ul style="list-style-type: none"> • Maximum capacity of not less than 3 m² per 8-hour shift. • Working width of 400 mm. • Line resolution of 0.100 mm or better. • Foot-activated fresh water spray zone with splash protection. • Magnetic centrifugal pump for developer circulation. • Integrated mechanical squeeze dryer. • Transparent top with security switch. • Maintenance free design and easy disassembly and full access to all inner parts without special tools. • In-built 1000W quartz heater. • Power supply: 220 - 240 V~, 50-60 Hz, 1P 	1

9	PCB Exposure Unit	<ul style="list-style-type: none"> • Banks of 2 x 7 super-actinic UV tubes (20W each). • Independent controls for top and bottom UV light banks. • Suitable for exposing and curing solder mask. • Suitable for fine-line PCBs. • Maintenance free vacuum with gauge display (1380 l/hour). • Digital countdown timer (1 sec. to 9 min 59 sec.) with auto-reset and beeper, ammeter, and cooling fans for extended exposure time. • Minimum exposure area of 300 x 400 mm. • Power supply: 220 - 240 V~, 50 - 60Hz, 1P • Special reflectors for minimum undercut • Analogue light emission display • Lower exposure surface from 8 mm special glass • Upper exposure area from structured Mylar foil in a sturdy frame • Working area 570 x 300 mm • Built in cooling fan allows long time exposure or baking processes • Separate choice of upper/low exposure possible • Sturdy steel housing 	1
10	Photoplotter	<ul style="list-style-type: none"> • Stand alone unit - no separate PC required. • Includes full software package for additional functionalities such as film arrangement, print preview, aperture editing, negative plotting, and image mirroring. • Output resolution of 16256 x 12700 dpi. • Plotting speed of 7 mm of film width per minute. • Source light: Laser diode (670 nm - red). • Data input format: Gerber (RS 274D, RS 274X), high resolution BMP. • Data transfer thru USB stick or via USB cable. • Changeable plot speeds (at least three settings). • Can support board size of 300 x 400 mm. • Power supply: 220 - 240 V~, 50 - 60Hz, 1P 	1

11	One (1) Lot Recirculating Wastewater Treatment	<ul style="list-style-type: none"> • Rinsing waste water treatment using ion exchange technology. Should decrease chemical oxygen demand with post treatment of etching and galvanic rinsing water. • Filter arrangement: a cotton pre-filter, two cation filters, and a pH neutraliser. • Storage sump tank capacity: 220 litres. • Cleaning capacity: 20 l/hour. • Lower and upper sump control switches. • Built-in hose pump. • In-built pH meter. • Integrated cotton filter candle 10 µm (active carbon filter) • Significant change of color when loaded with metals • Can additionally do PH neutralization and discharge to the drain, if desired. • Includes drain water recirculation. • Regeneration of ion exchange resins by supplier or by user at little cost • Drain water quality should be in accordance with Philippine regulations including but not limited to, RA 9275 - Clean Water Act, RA 1364 - Sanitary Engineering Law, and DENR AO 35 - Revised Effluent Regulations of 1990. • Power supply: 220 - 240 V~, 50 - 60 Hz, 1P 	1
12	Surface Finish Chemical Nickel and Gold (ENIG)	<ul style="list-style-type: none"> • Suitable for lead-free soldering, contact switches, AL-wire bonding, and high aspect ratio boards. • Can support board size of up to 300 x 400 mm. • Completely planar surface finish for surface-mounted devices. • E-Test compatible. • Produces PCBs with long storage time, as long as 12 months, and excellent resistance to ageing. • DC gear motor with step-less variable stroke speed adjustment for bath agitation. • Treatment tank capacity: 20 l. • Galvanic copper tank capacity: 60 l. • Integrated air injection and step-less regulated rectifier for the galvanic plating tank. • Total of five (5) treatment tanks (cleaning, pre-dip, catalyst, intensifier, reserve tank) and a separate galvanic plating tank. • Two treatment tanks equipped with thermostatically controlled teflon heater. • Heaters: 2 x 800 W. • Rectifier: 2 x 6 V, 80 A. • Power supply: 220 - 240 V~, 50 - 60 Hz, 1P 	1

One (1) Lot Rapid Prototyping Upgrade Accessories			
Item	Description	Specification	Quantity
1	Film Punch	<ul style="list-style-type: none"> • Additional accessory for the Photoplotter. • Can support films for board size up to 300 x 400 mm. • In-built magnifier for layout position control. • X and Y axes adjustment with handwheel. • LED light for the punch bush. • Includes pins for fixing the layout with reference holes. 	1 set
2	Dark Room	<ul style="list-style-type: none"> • Portable and easy to disassemble. • Provide total blackout. • Additional accessory for the Photoplotter. • One tank each for developing, fixing, and rinsing. • Tank accessories such as covers and hoses for emptying. • External dimensions: 200 x 120 x 120 cm. 	1 set
3	Photoplotter Film Processing Unit	<ul style="list-style-type: none"> • Additional accessory for the Photoplotter. • One tank each for developing, fixing, and rinsing. • Tank accessories such as covers and hoses for emptying. 	1 set
4	CNC/Milling	<ul style="list-style-type: none"> • Depth limiter • Pressure foot • USB Camera • Enhanced dust extraction system • Vacuum table • Protective hood and rack • Calibration board • Tool boxes • Glider for Depth Limiter 	1 set

ANNEX B: OTHER REQUIREMENTS

Item	Description	Specifications
1	Site Acceptance Test (SAT) at EPDC	<p>SAT of equipment shall cover the following fields: quantity, marking, origin, technical specifications, operation under applied standards.</p> <ul style="list-style-type: none"> • Testing and setup of equipment would be carried out by External Provider as part of SAT. For multiple bids, the End User shall coordinate with the External Providers regarding testing and setup. • During SAT, EPP Training must be provided to at least 10 participants from ASTI and EPDC. • Training should be a minimum of five (5) days and may be extended as needed to ensure maximum retention. • External Provider and Representative shall sign on the Certificate. • If Representative fails to sign the Certificate of Acceptance upon completion of the tests, the aforementioned shall immediately notify the External Provider in writing the reasons for the failure.
2	Documentation	<p>The Bidder is required to provide the following list of documents:</p> <ul style="list-style-type: none"> • Technical Literature of instruments listed in offer. <ul style="list-style-type: none"> a. Product Datasheets b. User Handbook/Operators Manual/Quick-start Guide (after award of tender) c. Technical Manuals (after award of tender) • List of project references in Asia of similar project scale. • Provide a comprehensive checklist of equipment and accessories.
	Delivery	<ul style="list-style-type: none"> • Must be delivered to EPDC Bldg., MIRDC Compound, Bicutan, Taguig City. • All equipment should come in separate boxes irrespective of size and weight. • Equipment and starter chemicals shall be shipped separately. • Startup supplies should be sufficient to support commissioning and turnover test, and initial production run for the entire system. • Final delivery and acceptance covering commissioning, testing, training, and test production is on or before June 15, 2020 (delivery beyond this date will be subject to availability of funds).

**I HEREBY ACKNOWLEDGE THAT I HAVE READ, UNDERSTAND AND AGREE TO
COMPLY WITH ALL REQUIREMENTS STATED IN THE TERMS OF REFERENCE.**

Name : _____

Designation : _____

Company Name : _____

Date : _____