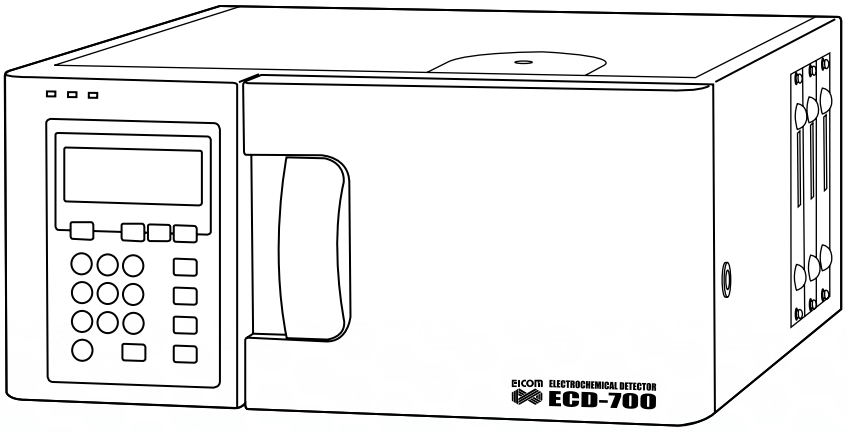
USER'S MANUAL

AC16-0816

Electrochemical Detector
ECD-700



ELECTROCHEMICAL DETECTOR
ECD-700

USER'S MANUAL

(For 1-channel amperometric model)

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SAFETY

Read this manual carefully and in full. All safety and operating instructions should be read before installation and operation.

Retain this manual. The safety and operating instructions should be retained for future reference.

This instrument should only be used in the laboratory or similar indoor environment, for analytical purposes.

Operation of this instrument should only be performed by personnel trained in laboratory work, and who are aware of the possible dangers involved.

Avoid direct contact with dangerous materials used in the operation of liquid chromatography. Adequate protection including gloves, masks, glasses, clothing and ventilation must be provided if toxic or harmful solvents and reagents are used.

This instrument should be operated only from the type of power source indicated in the label located on the rear panel.

Do not overload wall outlets and extension cords as this can result in fire or electric shock.

Voltages present inside this instrument are potentially dangerous. If there are mechanical troubles with the instrument, the power cable should be removed until the causes of the trouble are removed by qualified service personnel. Do not attempt to service the instrument yourself without precise knowledge as opening or removing covers may expose you to dangerous voltage or other hazards.

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Check the packaging to ensure there was no damage during transportation. After unpacking, please check the appearance of the instruments. All the parts in the package must be checked off against the list below. If damages or extraordinary conditions are observed on them, please contact your local distributor or EICOM.

List of Parts and Accessories

Items	Specs/Code	Qty	Remarks
Electrolysis Cell	EC-500	1	
Working Electrode	WE-3G (Graphite)	1	Standard type
Gasket	GS-25	1	25 μm thick
Reference Electrode	RE-500	1	Ag/AgCl Electrode
Reference Electrode Cover	RE-CO	1	
Silicone Rubber Tube	10 cm (1 mm, I.D.)	2	For Electrolysis cell outlet tube connection
Silicone Rubber O-ring	P3 (small)	1	For counter electrode
Silicone Rubber O-ring	P4 (medium)	3	For reference electrode
Silicone Rubber O-ring	P5 (large)	1	For electrolysis cell outlet screw
Ferrule	Daiflon 1/16 in	3	For electrolytic cell inlet connection
Tube Fitting	PEEK 1/16 in	2	For column connection
Disposable Syringe	2.5 mL	1	For aspirating liquid in the cell
Wrench	8-10 mm	1	
Wrench	4-5 mm	1	
Signal Cable	1.5 m	2	For connection with data processor
Signal Cable	15 cm	1	For self auto zero connection
Screwdriver	Cross Slot Type	1	
Screwdriver	Straight Slot Type	1	
Power Cable		1	
Grounding Cable		1	
User's Manual		1	

2. NECESSARY CONDITIONS

2.1. Place for Installation

ECD-700 is designed only for indoor use. Do not expose to direct sunlight, high humidity or dust. Place on flat and stable surface in a room with minimal temperature variation.

2.2. Power Sources

ECD-700 should only be operated by a 100V-240V AC 50/60Hz power source. If this power source is not available in your lab, please install an electric transformer between the wall socket and the ECD-700. Use an appropriate power supply with minimum voltage variation and enough electric capacity.

2.3. Grounding

Grounding is necessary to avoid electrostatic noise on the recording signals and electric shock. Grounding of ECD-700 with recorders is also very important as electrical isolation will cause potential shift on the recorders.

2.4. Recommended Conditions for High Performance Liquid Chromatograph (HPLC) Pumps

ECD-700 requires the following HPLC pump conditions for sensitive detection.

- Minimum pulse noise.

  Electrochemical detector is very sensitive to the pulse flow of mobile phase. If high pulse flow is observed on your HPLC pumps, please use pulse dampers (PL-100, EICOM).

- Clean flow lines.

  If metal ions or oils contaminate the mobile phase, unstable baseline or high background current may be observed. To remove the oil, wash the lines and pump heads with acetone. For blocking of metal ions eluting from stainless steel parts and tubes, clean up lines and pumps as instructed below;

  a. Wash pumps and flow lines with 100 mL of twice diluted nitric acid (ca. 30% HNO3) solution.

  b. Deliver 1 L of 0.1 mol/L phosphate buffer (pH 3.5) containing 100 mg/L EDTA-2Na through the line.

- Clean sample injector

  Contamination of sample injectors gives interfering peaks on chromatograms.

- Stainless steel or PEEK tubes for upstream line of ECD

  Titanium or other metal tubes except for stainless steel (SUS) cause unstable baseline and high background current.

- Do not use on-line metal filters for mobile phase filtration.

  Metal filters can sometimes increase background current on the ECD. Instead of metal filters, the connection of a precolumn (guard column) is recommended for column protection.

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Overview of ECD-700 is illustrated below.

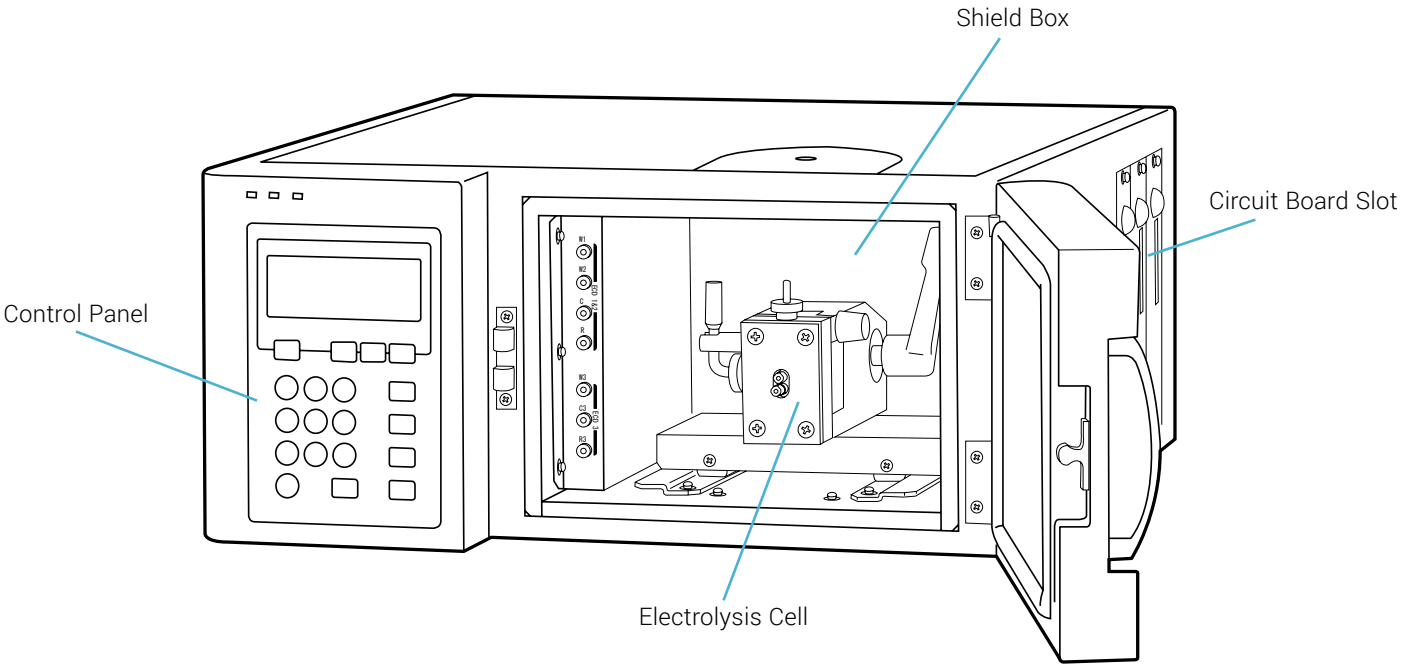

Fig. 1 System Overview

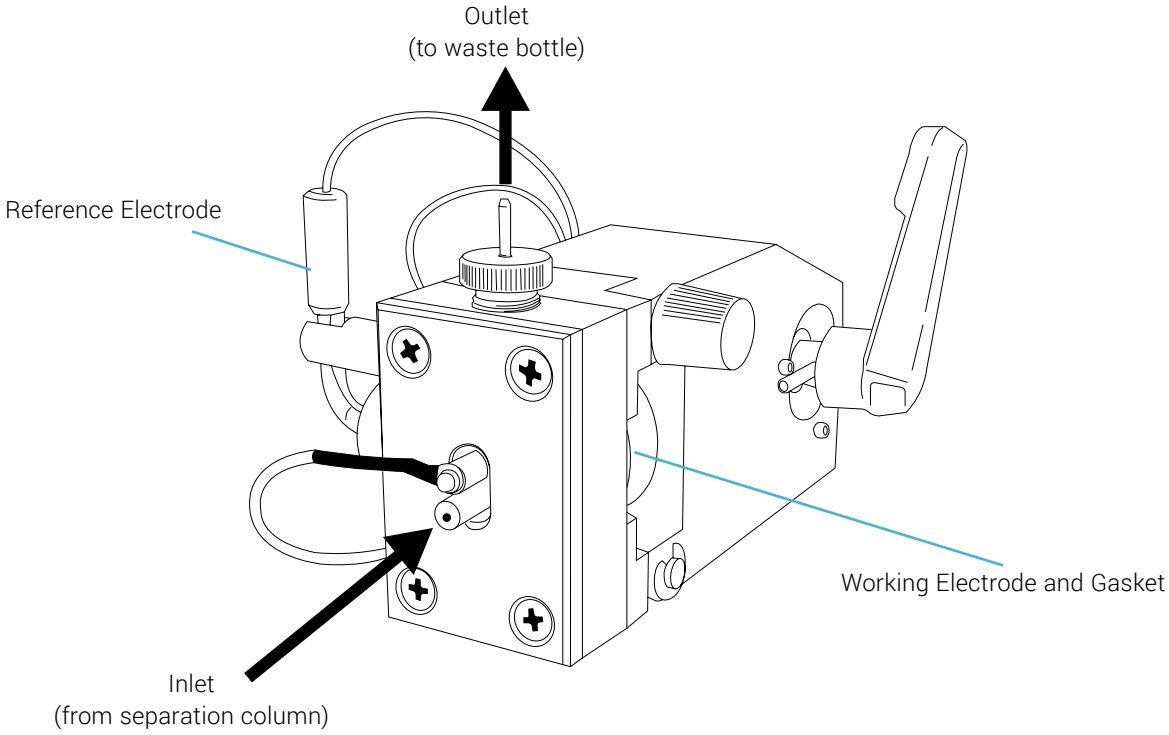

Fig. 2 Electrolysis Cell

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3.1. Control Panel

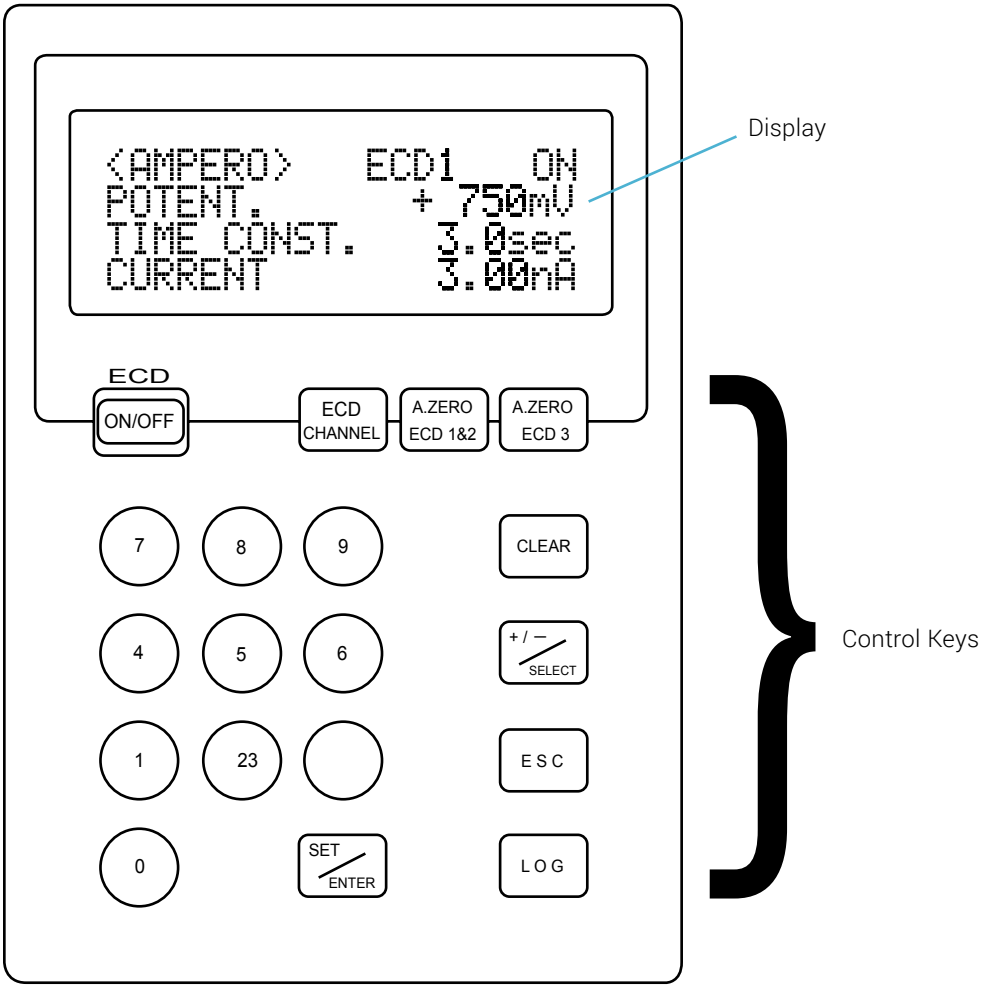

Fig. 3 Control Panel

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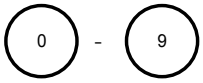
Key	Name	Function
	ECD ON/OFF	Turning ON/OFF ECD. To turn OFF ECD, press more than 1 sec. (This protects from undesired shutoff of ECD by mistake).
	ECD channel	Select ECD channels. (For additional channels. Not in use on standard model)
	Auto zero ECD 1&2	Offset ECD output signal of channel 1&2 to 0 V. (Channel 2 is not in use on standard model)
	Auto zero ECD 3	Offset ECD output signal of channel 3 to 0 V. (For additional channels. Not in use on standard model)
	Clear	Clear parameters in setting. Clear electrode logs.
	+/- Select	Select '+/-'of applied potential. Select 'Yes/No' in reply to dialogues asking Yes or No.
	Escape	Escape from LOG mode.
	LOG	Go to LOG mode
	Set/Enter	Start input of parameters. Enter parameters.
	Number	Set numbers.

3.2. Left Side Panel

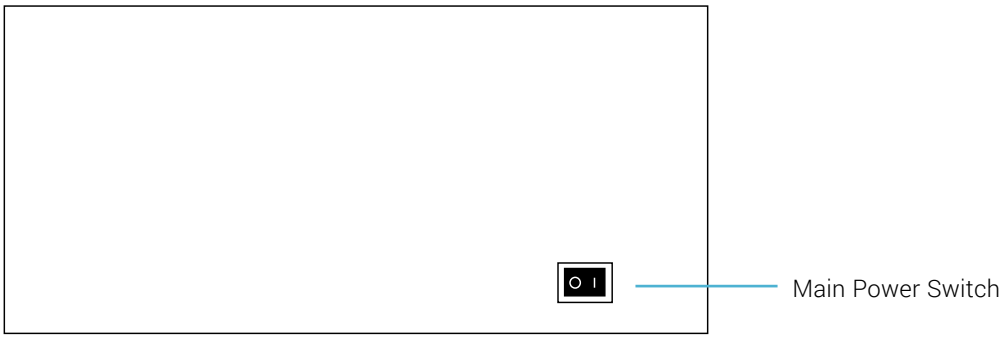


Fig. 4 Left Side Panel

3.3. Right Side Panel

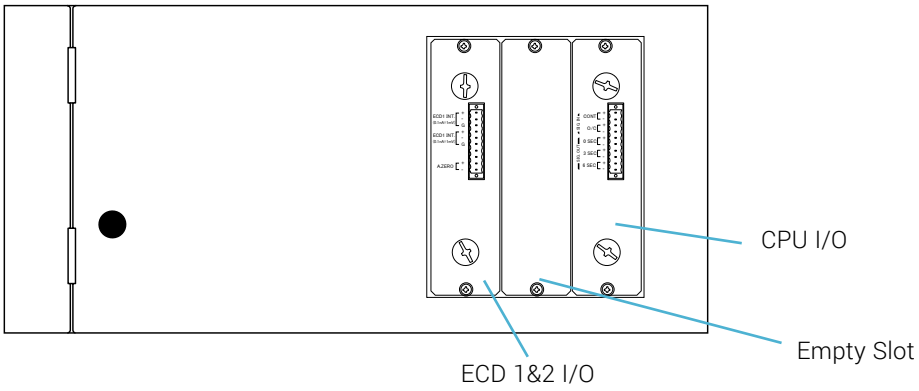


Fig. 5 Right Side Panel

ECD 1 & 2

Signal output terminals for a recorder or an integrator. 0.1 nA of electric current is converted into 1 mV voltage signal. ECD 2 is for segmentalized working electrodes, and is not in use in standard model.

A.ZERO

Auto-zero input terminal from an autosampler, ECD-700 itself or other external equipment. Contact closure signal (>0.3 sec) is available.

SIG. IN and SIG. OUT

When ECD-700 receives a signal on SIG. IN terminal, delayed signals are automatically sent out from SIG. OUT terminals. CONT. is for contact closure input and O/C is for Open/Close signal input.

Empty slot

For future expansion.

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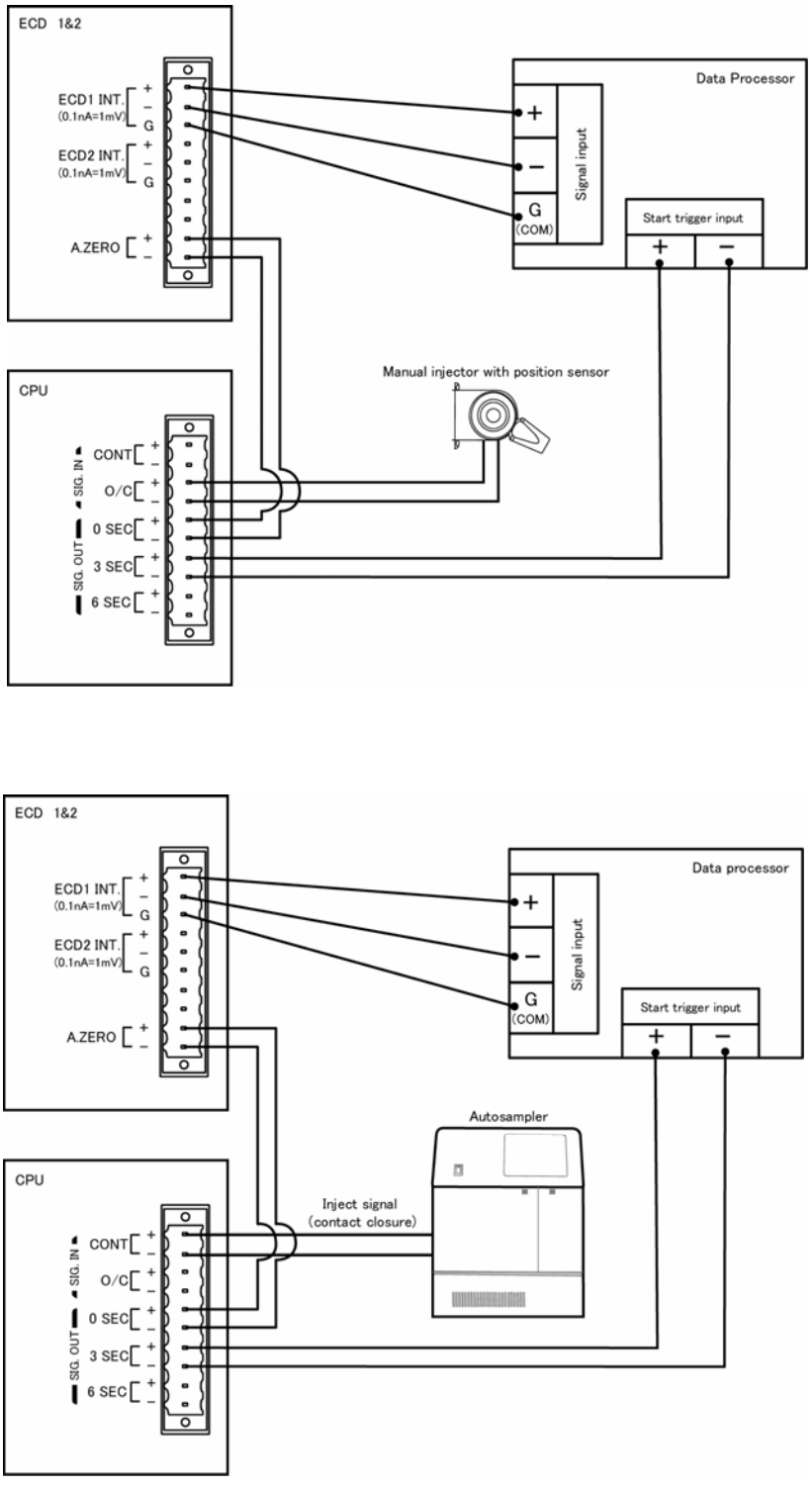

Fig. 6 Connection of ECD-700 with External Equipment.

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3.4. Rear Panel

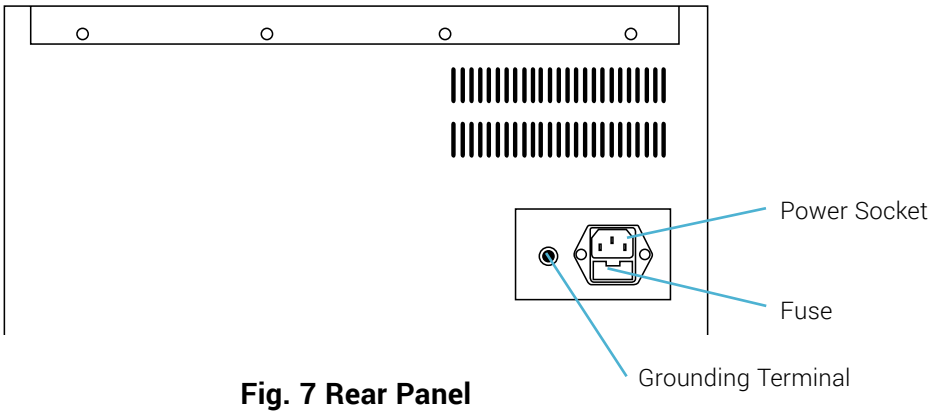

Fig. 7 Rear Panel

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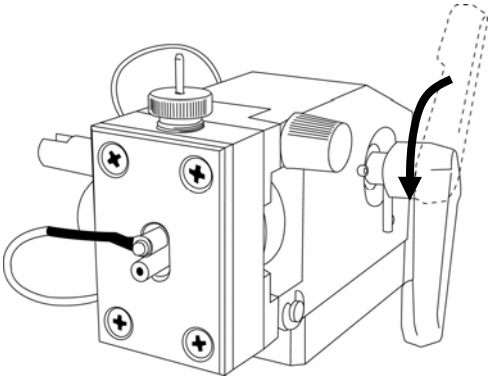
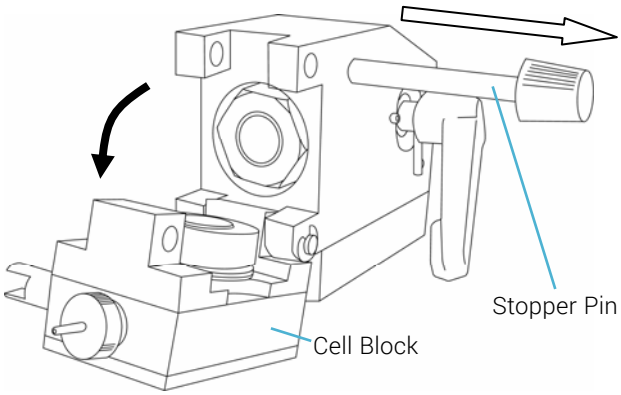
3.5. Electrolysis Cell System

The electrolysis cell is set in the shielding box to avoid rapid temperature changes and electric noises. Therefore, the lid of the shield should be firmly closed during analysis. When the EICOM column oven ATC-700 is used with the ECD-700, remove the round shaped upper/bottom cover of shield box and set a duct of ATC-700 into the upper/bottom opening of the ECD-700.

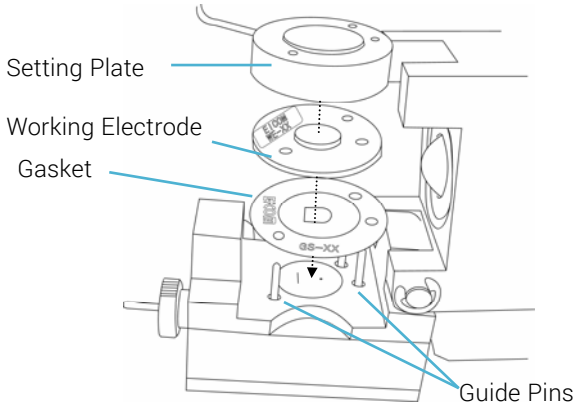
3.5.1. Installation of Electrodes onto the Electrolysis Cell



Push the locking handle down.



Pull out the cell block stopper pin and open the cell block forward.



Pick the working electrode setting plate up and set the gasket and the working electrode inserting guide pins of the cell block into their guide holes. Labeled side of the working electrode and the gasket should be set upside.

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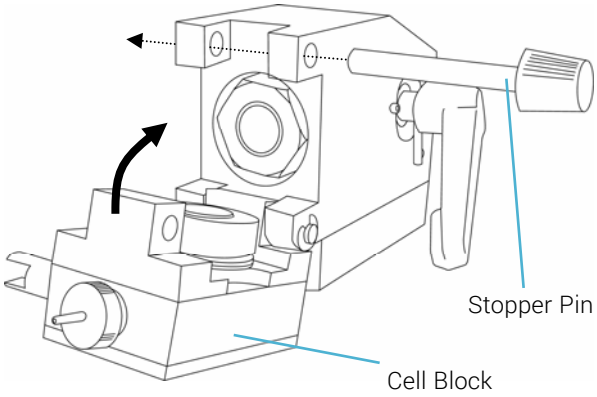
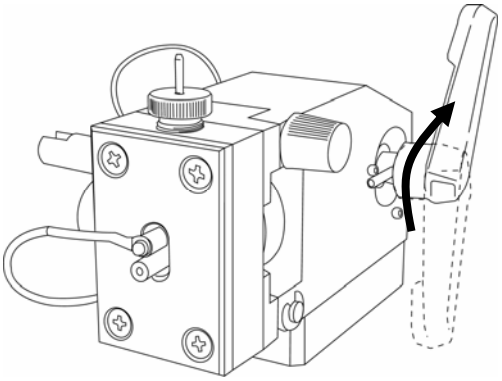
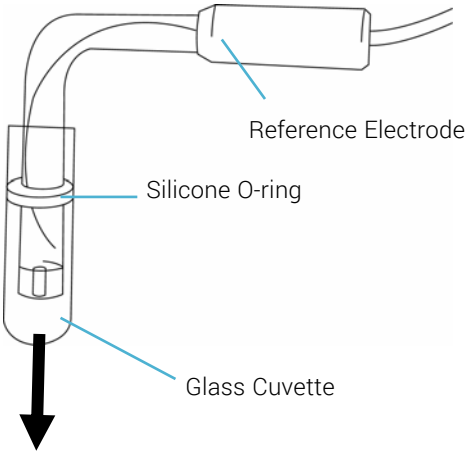


Close the cell block, and then insert the stopper pin into the cell



Push the handle up to lock the cell.



The tip of reference electrode was sealed by a small glass cuvette filled with 0.1 mol/L LiCl and acetic acid solution before shipping. Pull the electrode from the cuvette just before use.

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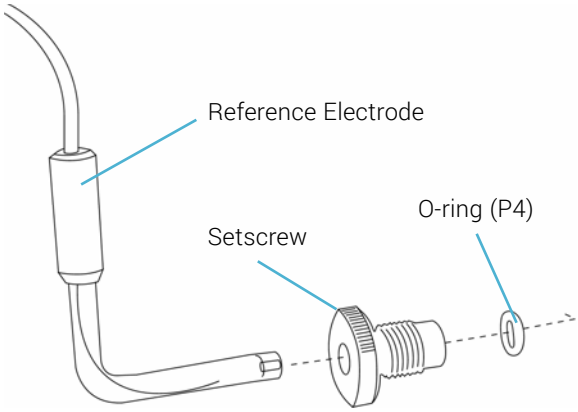
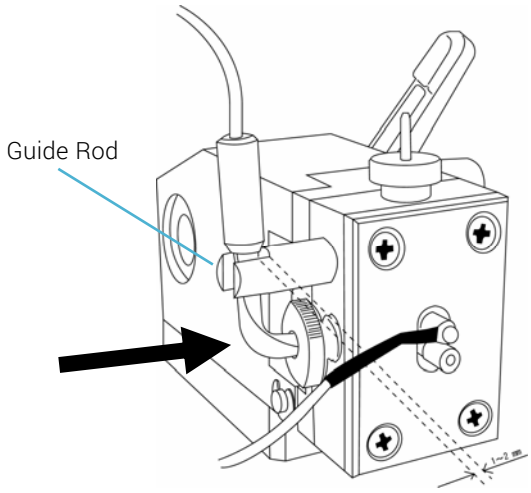
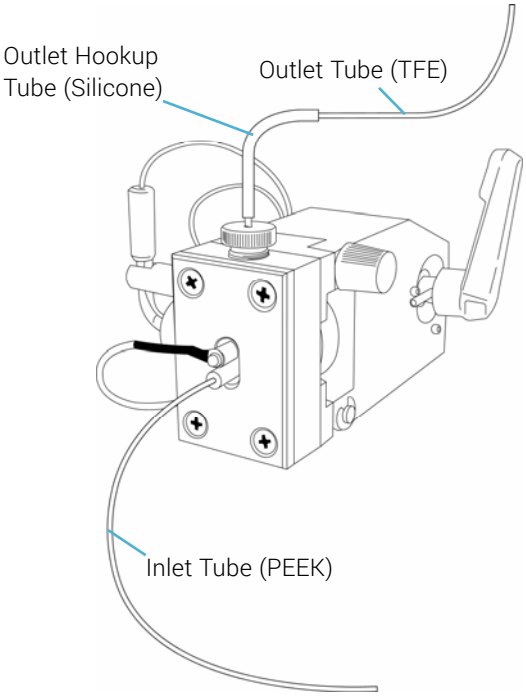


Insert the reference electrode into the setscrew and the orange colored o-ring. A setscrew is initially mounted on the cell block. DO NOT use the white colored silicone o-ring initially used for sealing of electrode.



Insert the electrode parallel with the notch in the guide rod into the side opening and fix it by the setscrew.



Connect cell inlet and outlet tubes.

(These tubes may be connected before shipping.)

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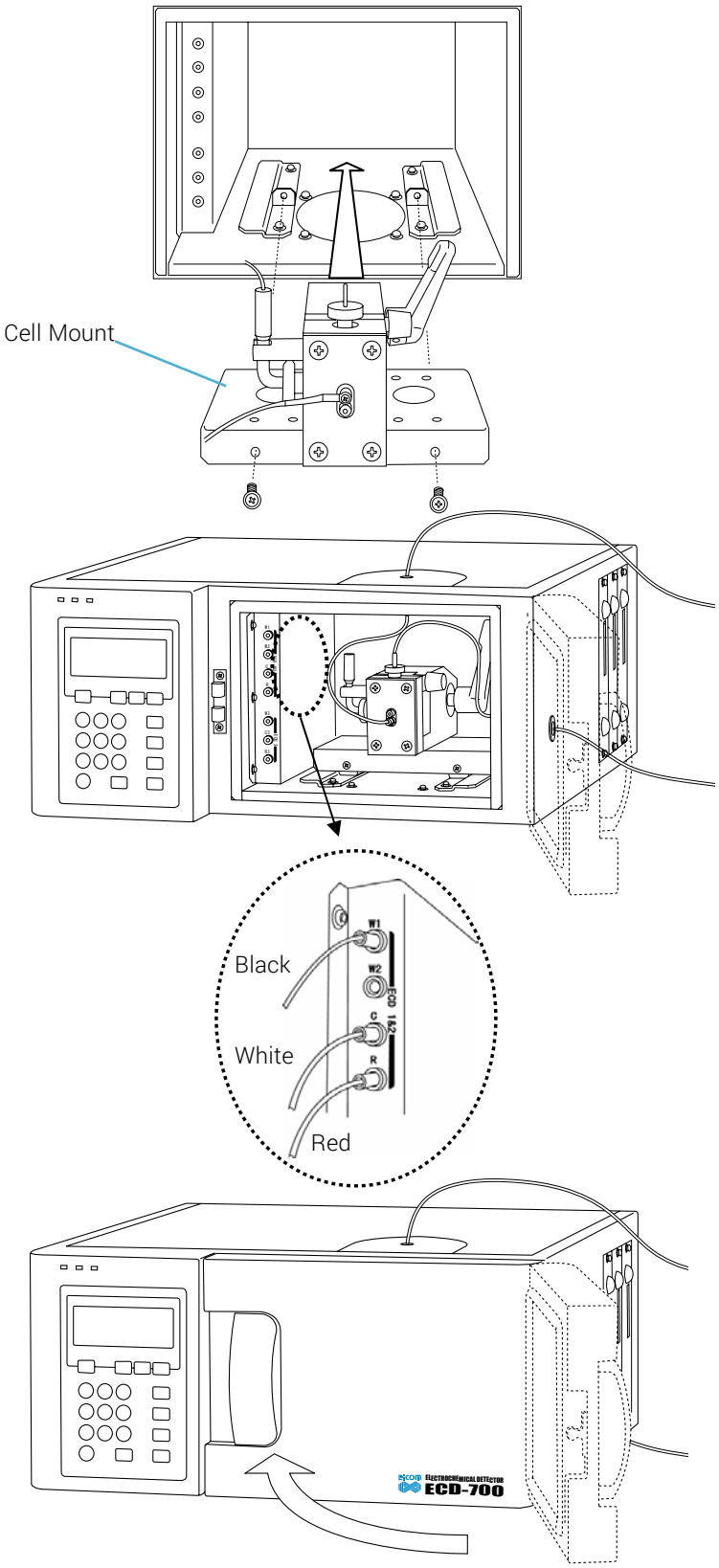

Fix cell onto the mount and slide the cell into the shield box.

Pass the cell inlet and outlet (waste) tubes through access ports.

Connect red, black and white wires to R, W1 and C sockets of ECD 1&2 located on the upper left of the shield box, respectively. W2 is not used in the standard configuration.

Red, black and white terminals are for reference, working and counter electrodes, respectively.

Close the front door.

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3.6. Construction of Whole HPLC System

Basic system constructions are illustrated in Fig. 8 to 10. For high sensitivity measurements, EICOM 700 series HPLC equipment is best suited as it provides inert flow lines, high degassing capacity, computer controlled pulse quenching function and accurate temperature control. All of the equipment should be electrically grounded to each other to eliminate electrostatic noise generated in the flow lines.

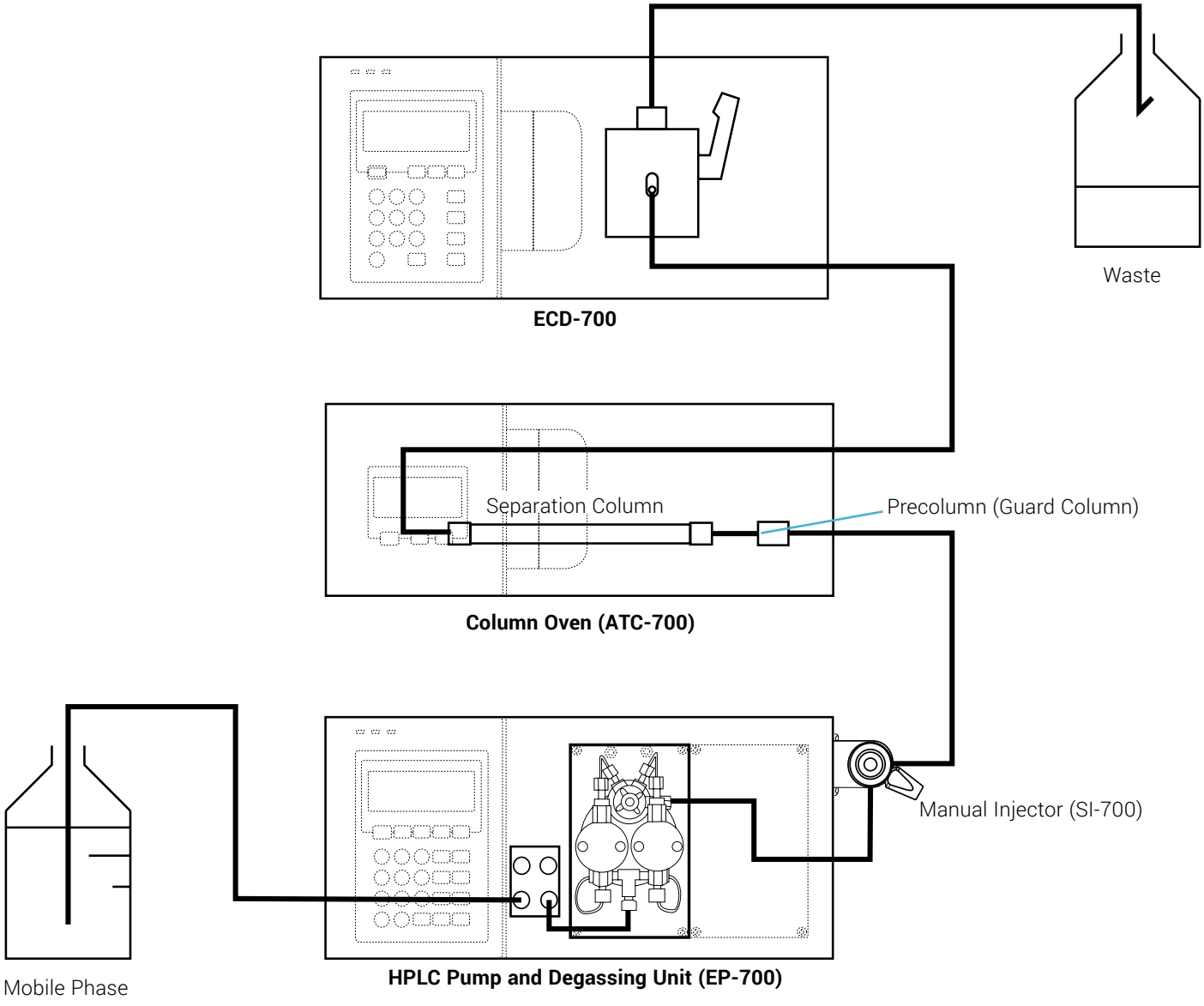

Fig. 8 Manual Injection System.

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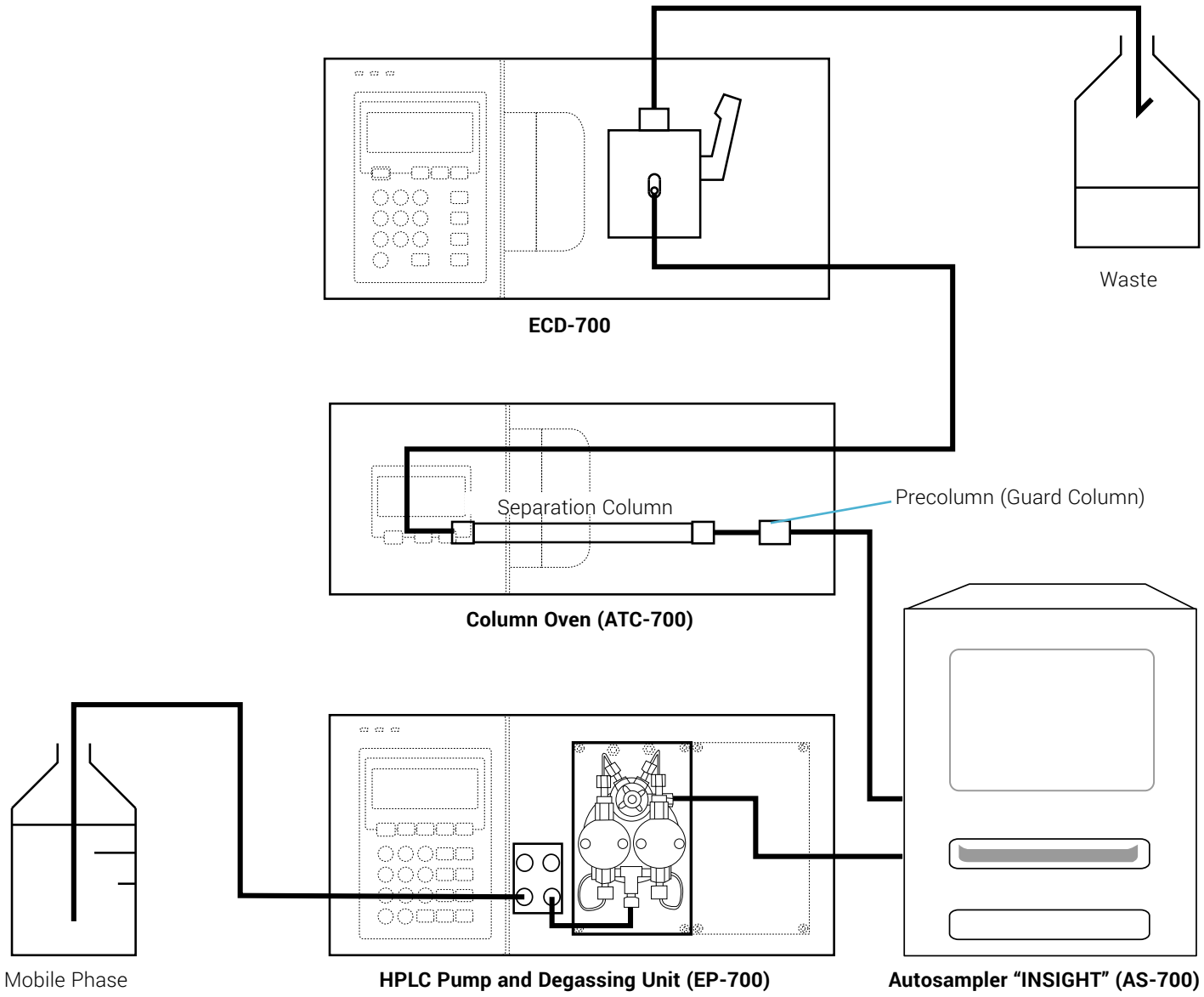

Fig. 9 Automated Injection System.

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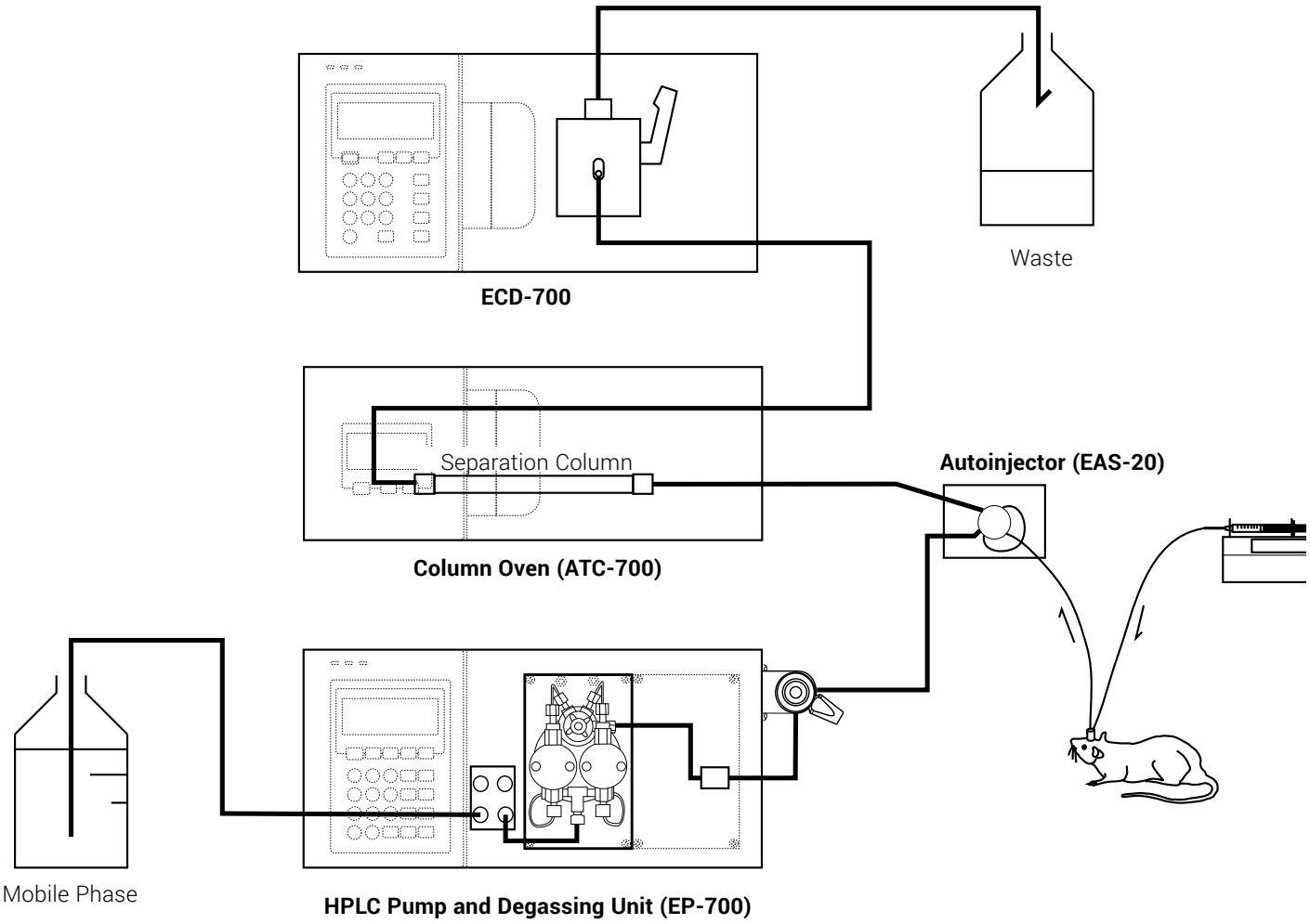

Fig. 10 Microdialysis Automated Injection System.

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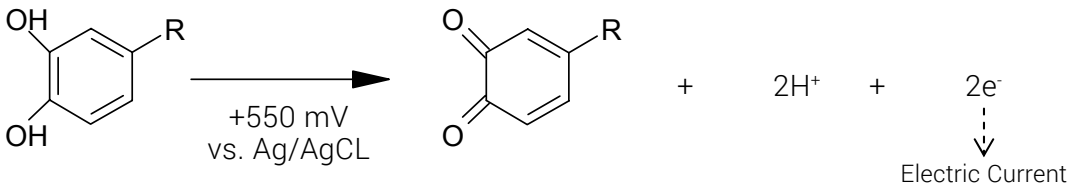
4.1. Principle

The basic principle of electrochemical detection is based on the measurement of the electric current derived from the electrochemical reaction of analytes taking place on the surface of electrodes (Scheme 1).



Scheme 1. Electrolysis of Catechols

Upon electrochemical oxidation, free electrons are released to the counter electrode. In the case of reduction, electrons are provided from the counter electrode to the analyte. The ECD detects this electrical current which linearly correlates to the analyte concentration loaded into the HPLC.

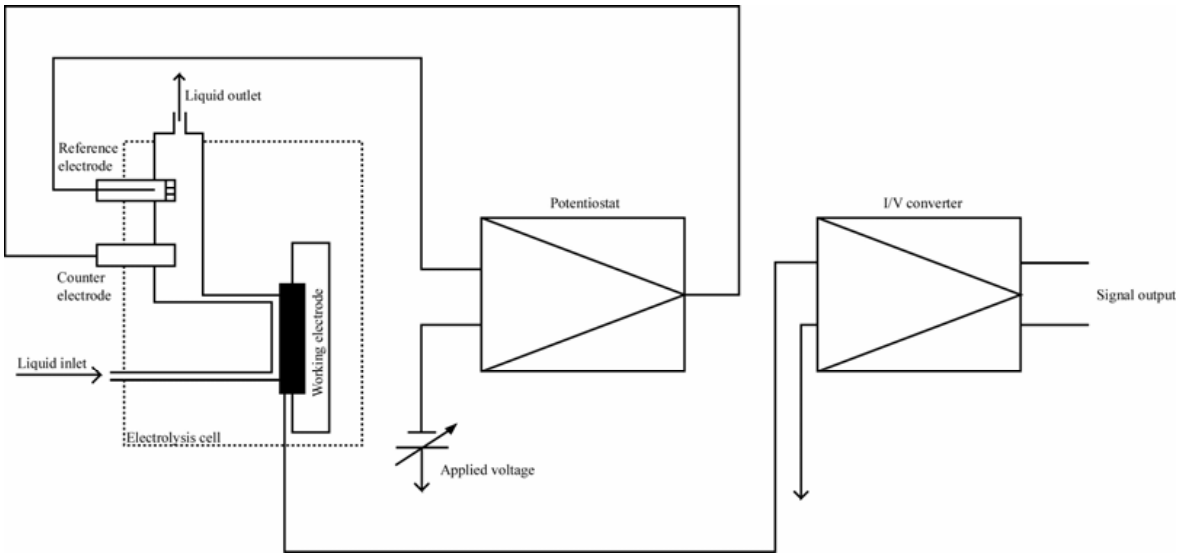


Fig. 11. Schematic Diagram of Electrolysis Cell

In electrochemical detection, a constant and known potential difference between the working electrode and the mobile phase is required to obtain stable and reproducible response. To achieve this, electrochemical detectors usually consist of a three-electrode potentiostat system. In this system, a working electrode, a counter electrode and a reference electrode are set in the flow cell. The working electrode is kept at electrically-zero potential by connecting it to the virtual ground of the electronics. The counter electrode acts as an opposite pole 17 electrode

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against the working electrode. Desired potential is applied on the counter electrode versus the working electrode. However, due to formation of electric double layer and potential drop (IR-drop) caused by electric resistance of the mobile phase, actual potential between the working electrode and the mobile phase may differ from the desired potential. Moreover, status of electric double layer and electric resistance of the mobile phase are strongly influenced by the composition of the mobile phase. IR-drop is also influenced by the actual current between the working and the counter electrode at the same time. These facts mean that if we use only two electrodes, the working and the counter electrode for electrochemical detection, stable and reproducible response is not obtainable. A third electrode, the reference electrode, is therefore required to monitor the potential of the mobile phase. Potential of the reference electrode versus mobile phase is constant and known, and does not vary according to mobile phase composition and actual current between the working and the counter electrode. In this three-electrode potentiostat system, the potential selected for the working electrode versus the reference electrode (i.e. versus mobile phase) is applied and controlled by the counter electrode. If any difference is measured between the working and reference electrodes, the counter electrode adapts its potential to eliminate the difference.

4.2. Applied Potential

4.2.1. Setting Electrolysis Potential

Optimum working electrode potential (applied potential) in the given chromatographic conditions varies depending on each analyte. Commonly, the electrolysis current is highly relevant with applied potential in a certain range. To know such relationship between the current and voltage (voltammogram) is important to determine the optimum potential. For example, when electrolysis currents (peak heights) of a certain catecholamine are plotted versus corresponding potential, a sigmoid-like curve shown below is usually obtained.

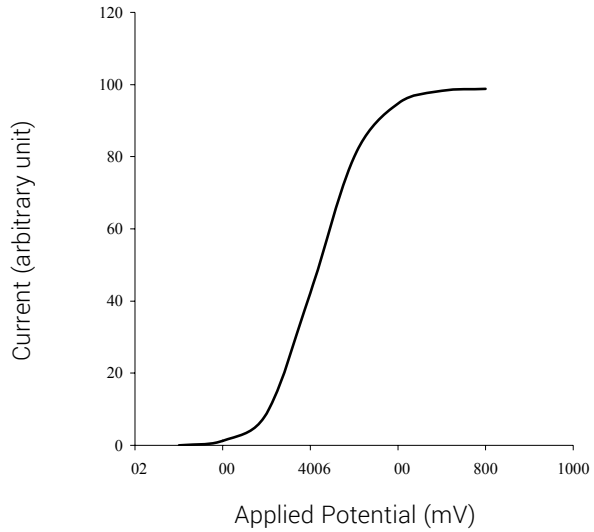

Fig. 12. Voltammogram of Catecholamines

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In this figure, maximum current is attained at the voltage of +650 mV or above. This means that almost 100% of molecules which contact the surface of the working electrode are electrolyzed at voltages of +650 mV or higher. However, if the voltage is set higher than +650 mV, other interfering peaks also tend to become higher. Thus, most sensitive and selective detection is enabled at +650 mV. The voltage which gives a half current of maximum is the specific value for each substance in given chromatographic conditions and it serves as a useful reference for peak identification. If concentration of catecholamines in the sample is high enough to detect, and other interfering peaks appear in the chromatogram, applied voltage can be reduced to lower than +650 mV to diminish interfering peaks.\

4.2.2. Measurement with Electrolytic Oxidation Current

Oxidation mode is a common mode of detection. Set the polarity of applied potential to + (plus).

4.2.3. Measurement with Electrolytic Reduction Current

When the reduction mode is performed, set the polarity of applied potential to - (minus). However, measurement with reduction current is usually difficult because dissolved oxygen in the mobile phase gives high background current and unstable baselines. If the mobile phase is prepared appropriately and well degassed, -400 mV is usually applicable to the working electrode, but good results are not always obtainable. In other words, reduction mode does not suit for routine analysis because of its unstableness.

4.2.4. Stabilization Time

ECD-700 poses high background current just after it is started up or applied voltage is altered, and it gradually reduces to a steady state. Under normal conditions, 30 to 60 minutes may be required to stabilize the background current.

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4.2.5. Selection of Working Electrodes and Their Features

Working Electrode	Model	Features
Graphite	WE-3G	EICOM standard electrode Best suited for sensitive monoamine analysis High S/N ratio, Economical, Maximum concentration of organic solvent is limited; Methanol: <30%, Acetonitrille: <3% Maximum voltage; <+1,500 mV
Pure Graphite	WE-PG	Multipurpose electrode High S/N ratio, 100% organic solvent is available Maximum voltage; <+1,500 mV
Glassy Carbon	WE-GC	Conventional electrode 100% organic solvent is available Maximum voltage; <+1,000 mV
Platinum	WE-PT	Selective and sensitive detection of H2O2 Acetylcholine or glutamate analysis using enzyme reactors
Gold	WE-AU	Selective and sensitive detection of thiols GSH, Cysteine and other thiols
Silver	WE-AG	Selective and sensitive detection of cyanides

4.2.6. Selection of Gaskets

Type	Thickness	Features
GS-25	25 µm	For sensitive analysis High electrolysis efficiency
GS-50	50 µm	For general analysis Low background noise
GS-25P	25 µm	For platinum electrode For sensitive analysis
GS-50P	50 µm	For platinum electrode For general analysis

4.3. Specifications

Standard Model	
Principle	Amperometric DC detection
Flow Cell	1-channel thin layer type amperometric
Circuit Board	1 flow cell 2-channel amperometric detection capable
Empty Slot	1
Applied Potential (Ch.1)	0 ~ ± 2,000 mV, 1 mV step
Applied Potential (Ch.2)	Applied Potential (Ch.1)
Auto Zero Working Range	± 1,000 nA
Current Working Range	± 1,000 nA
Working Electrode	Disc type Graphite (standard), Pure Graphite, Glassy Carbon, Platinum, Gold, Silver
Gasket	FEP film type, Thickness 25 µm or 50 µm
Reference Electrode	Ag/AgCl
Counter Electrode	SUS316
Liquid Contact Surface Material	PEEK, SUS316
Integrator Output Signal	± 10 V analogue (0.1 nA = 1 mV)
Time Constant	1.0 sec, 1.5 sec, 3.0 sec
Flow Cell Volume	Less than 1 µL
Flow Cell Container	Faraday Shield Box, Capable 2 Flow Cells
Communication Signal Input	CONT.: Contact Closure (>300 msec) O/C: Open/Close
Communication Signal Output	0, 3, 6, sec delayed 1 sec contact signal
Dimensions	400 (W) x 400 (D) x 190 (H) mm
Weight	12 kg
Power Supply	AC100 to 240V 50/60Hz
Power Consumption	70 VA
Optional Items	
Additional Working Electrode	2-channel segmentalized type graphite (WED-3G) or glassy carbon (WED-GC) working electrode
Additional Board (Channel 3)	1-channel DC amperometric board (AXB-7) x 1 or 1-channel DC coulometric board (CXB-7) x 1 capable
Flow Cell (channel 3)	1-channel amperometric flow cell (EC-300S) x 1 or 1-channel coulometric flow cell (PEC-510C) x 1 capable

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5.1. Preparation

5.1.1. Preparation for HPLC Pumps (see also 2-4)

If the pump is new or has been left non-operational for a long time, cleaning the pump lines is required. EICOM HPLC pump EP-700 does not require special pretreatment as it has inert flow lines and is thoroughly cleaned before shipping. After nitric acid cleaning, deliver 1 L of 0.1 mol/L phosphate buffer (pH 3.5) containing 100 mg/L EDTA-2Na, and then replace it with the mobile phase.

Contamination of the pump by oil and fat may affect the stability of baselines, other than metal ions. If the flow lines are contaminated by such hydrophobic substances, washing with acetone is effective to flush them.

5.1.2. Mobile Phase

Addition of salts in the mobile phase is necessary for its working principle. Generally, 0.02 to 0.1 mol/L buffer solutions such as phosphate buffer or citrate-acetate buffer are used to create electrical conductance of mobile phase. For 100% alcoholic mobile phase, sodium perchlorate or ammonium perchlorate is available as electrically conductive salts.

In most cases, issues with sensitivity and stability are caused by contamination of mobile phase. Please use high-purity solvents and reagents for preparation of mobile phase. Most of all, quality of water and organic solvents are critical for ECD. Use ultra-pure water (>18MΩ-cm) and HPLC-grade organic solvents to prepare the mobile phase.

5.1.3. Degassing Unit

The air and other gasses dissolved in the mobile phase will cause noise on the chromatogram. Degassing of the mobile phase is necessary to perform high sensitive analyses. If the on-line degassing unit is not available, degassing of the mobile phase under reduced pressure is required at least.

5.1.4. Columns

Use a good quality column for ECD. Residual metal ions eluted from the packing material and/or column filters sometimes cause high background current and baseline drift. When using such high metal residue containing columns, aging of column by delivering mobile phase for more than 24 hours may be required to obtain stable baselines.

When connecting the column to HPLC systems, please pay attention so that air is not be delivered into the column.

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Flow of mobile phase often produces electrostatic noise in the column and this will result in baseline noises on chromatograms. To discharge the static charge on the column, grounding of the column and ECD is necessary.

5.1.5. Waste Tube

The tip of the waste tube from the ECD in the waste bottle should not be moved. Movement of the tube tip also generates electrostatic noise on ECD. The tip of the waste tube should be kept below the waste surface level.

5.1.6. Leakage

Check for leaks at tube couplings and electrolytic cells. Leakage of mobile phase will negatively affect not only the data but also mechanical systems. If you notice a leak of mobile phase, please call your Eicom representative.

5.2. Setting Parameters

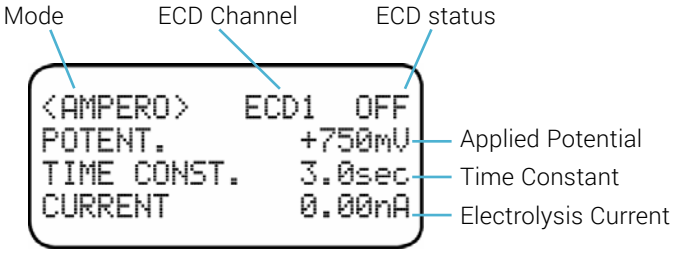
Before operation, please make sure all the instruments are properly connected.

[Setting Example]

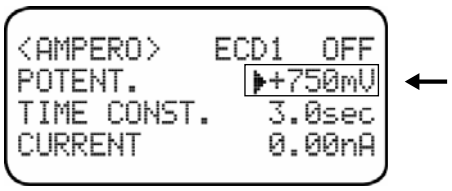
ECD channel used:	Channel 1
Applied potential:	+450 mV
Time constant:	1.5 sec

1) Switch on ECD-700. Initially, start-up diagnosis screen appears. After self diagnosis is done, normal screen which accepts parameter changes appears. If you do not need to change parameters from previous ones, you can skip to item 2) as ECD-700 stores previous parameters.

[Normal Screen]



Press SET / ENTER key once, blinking cursor appears at POTENT. line.



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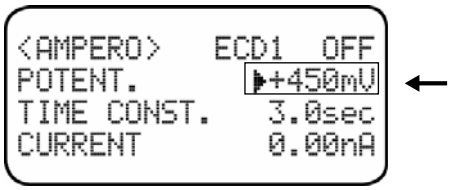
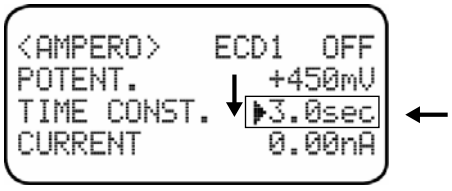
Press [4], [5], [0] keys to set desired applied potential

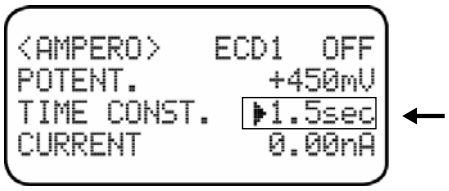


Press [SET / ENTER] key once to enter the parameter. The cursor moves to the next line.

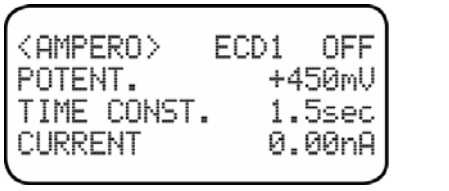


Press [+/-/ SELECT] key twice to select 3.0 sec for time constant.

1.0 sec, 1.5 sec and 3.0 sec are scalable for this parameter.



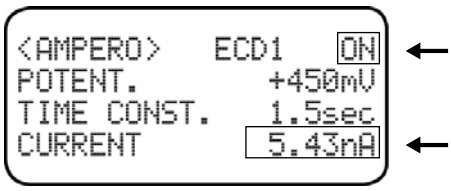
Press [SET / ENTER] key once to enter the parameter. The cursor disappears.



Please make sure all the parameters are correct before you go to the next step.

2) Start delivering mobile phase and check for leaks in entire system.

3) Press [ECD ON/OFF] key to activate ECD. Status of ECD changes from OFF to ON. Electrolysis current (background current) value starts to reflect actual current.



4) Confirm that the background current is gradually decreasing and coming to a steady state.

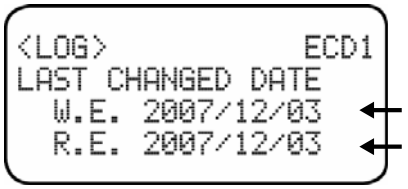
5) After the baseline is stabilized, start the analysis.

5.3. LOG

ECD-700 can save a log of the replacement of electrodes. Please note that these logs are NOT automatically updated. If you need to keep logs, please renew them manually.

5.3.1. Monitoring Logs

Press [LOG] key, log screen appears.



On the log screen, the latest changed dates of electrodes (or default value 0000/00/00) are displayed.

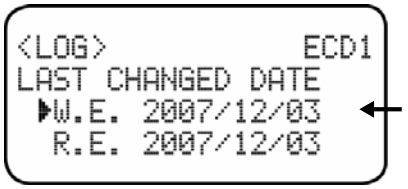
Press [ECD CHANNEL] key to change ECD channels.

Press [ESC] key to return to normal screen.

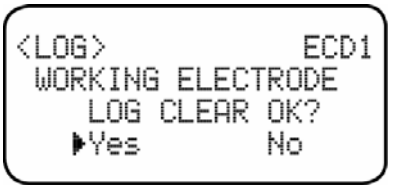
5.3.2. Updating Logs

5.3.2.1 Working Electrode

On the log screen, press [SET/ENTER] key. Blinking cursor appears at the W.E. line.



Press [CLEAR] key to delete current log.



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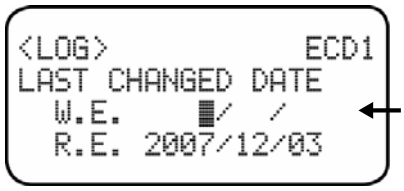
If you are sure you need to delete current log, press [+/- / SELECT] to select 'YES' and press [SET/ENTER] . After deletion of current log, renew a date.



Press number keys (0 -9) to set date (YYYY/MM/DD) and press SET/ENTER key once. Cursor moves to the next line.

5.3.2.2. Reference Electrode

On the log screen, press [SET/ENTER] key twice. Blinking cursor appears at the R.E. line. Set renewal date the same way as working electrode.

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6.1. Working Electrode (see also 6-4)

It is difficult to declare the life span of working electrodes because it depends on various conditions, but it is usually available for 1 year or longer if electrode is kept in good condition.

Decreased sensitivity and/or drifted baseline are sometimes caused by staining on the surface of the working electrode. In most cases, the cause of staining is contamination of the mobile phase. To remove the staining on the working electrode, wipe off its surface with soft and clean paper wipe (Kimwipes® is best for the purpose), well impregnated with acetone. If loss of sensitivity and unstableness of baseline are not recovered after wiping of the electrode, replace it with a new one. When polishing of the surface of electrodes with polishing compound is required, contact your local distributor or EICOM and follow further instructions.

Under optimal conditions, background current below 2 nA is obtainable with +450 mV applied potential and pH 6 buffered mobile phase containing 50 mg/L EDTA-2Na when using WE-3G for working electrode.

6.2. Reference Electrode (see also 6-4 and 7)

Life span of the reference electrode is about 1 year from the manufactured date. Be aware that the reference electrode deteriorates even when not in use. This means that the reference electrode can NOT be stocked for a long time. Therefore, scheduled purchases and replacements are recommended.

When the reference electrode becomes deteriorated, actual applied voltage between working and counter electrodes become higher than nominal value because of increased electric resistance of the reference electrode. In such case, baseline noise becomes higher.

The liquid junction (white porous ceramic tip) of the reference electrode should NOT be dried. If ECD-700 is not used for more than 1 month, dismount the reference electrode from the cell and immerse the tip in 1 mol/L LiCl solution. A glass hood cap is initially filled with acidic 1 mol/L LiCl solution.

6.3. Gasket (see also 6-4)

The most important factor for the gasket is the smoothness of the center hole cut edge. If the edge is wrinkled or cracked, electric noise is generated from the gasket. When you find these undesirable conditions on the gasket, replace it with a new one.

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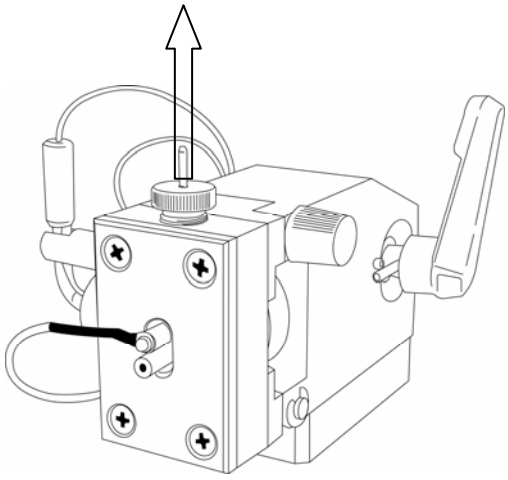
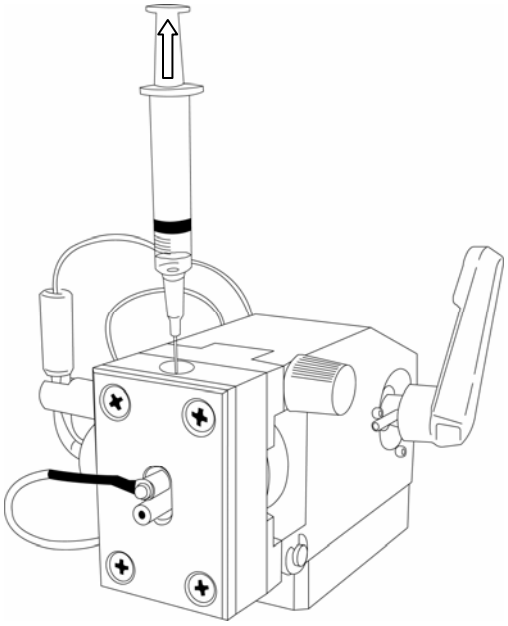
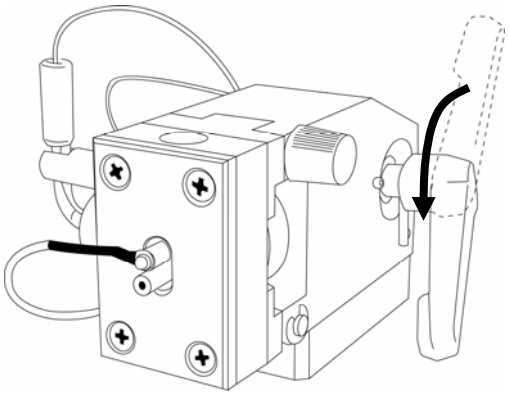
6.4. Maintenance of Electrodes



Disconnect red, black and white wires from shield box terminals and pull out the electrolysis cell. Then, unscrew the outlet screw.



Aspirate liquid in the cell by a disposable syringe with a needle from the top opening. Without this step, liquid remaining in the cell will cause leakage issues when it is opened.



Push the side handle down.

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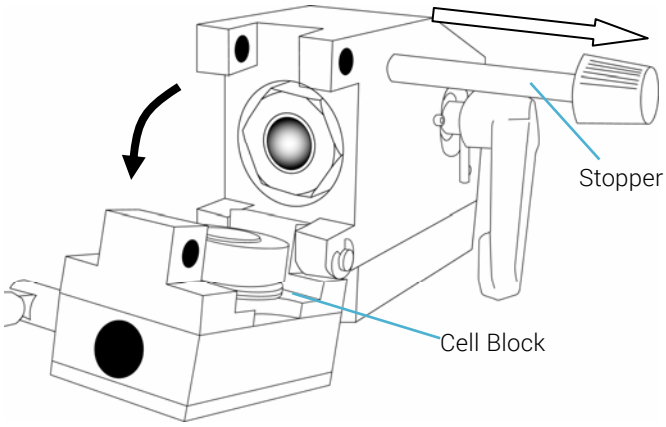
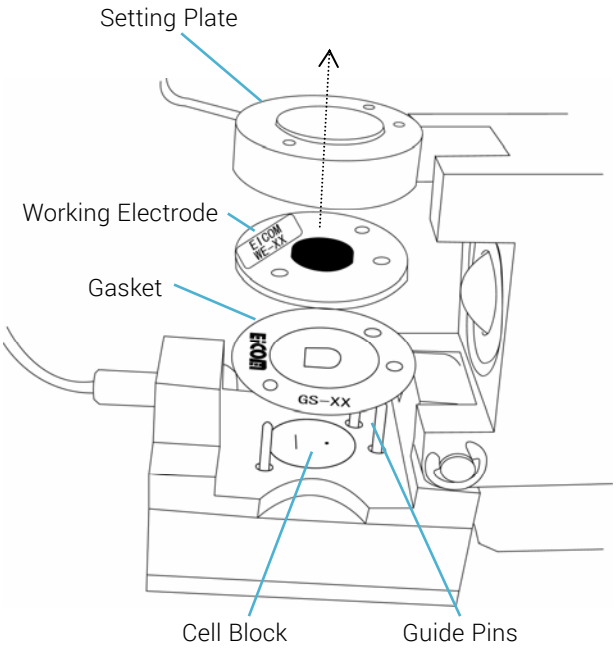
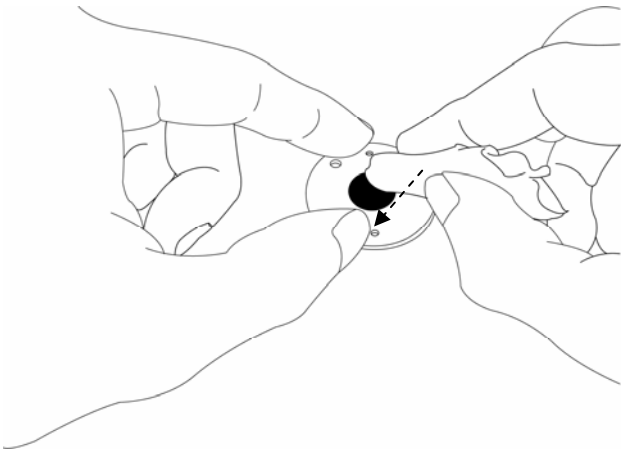


Pull out the cell block stopper pin and open the cell block forward.



Lift and dismount a setting plate, a working electrode and a gasket. Please note the correct order of parts. Each part should be reassembled in correct order as illustrated in the figure.

If liquid droplets are found on the cell block and/or gasket, gently wipe them off with papers wipes.



Wipe the smooth side of the working electrode 4 to 5 times in the same direction with soft and clean paper wipes (Kimwipes®) impregnated with acetone. DO NOT wipe the electrode with dry paper as it scratches the surface.

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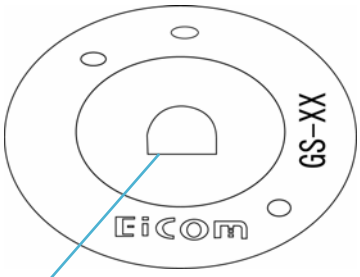
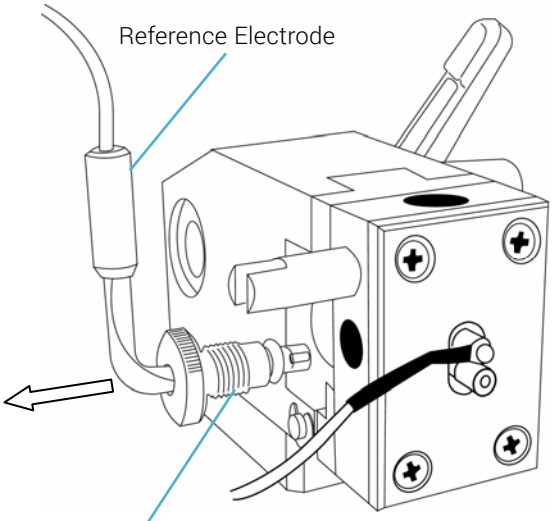
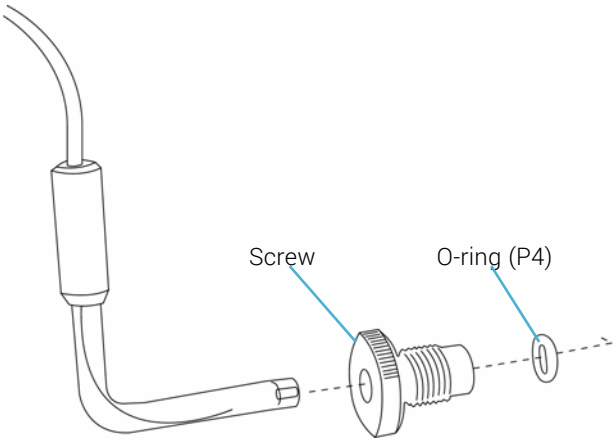


Cutting Edge of Gasket Hole

Check the cutting edge of the gasket. If the edge of it has gotten wrinkled or cracked, please replace it with a new one.



To dismount the reference electrode, unscrew the white setscrew located on the left side of the cell block and pull out the reference electrode.



The setscrew of the reference electrode is stopped by an orange colored o-ring.

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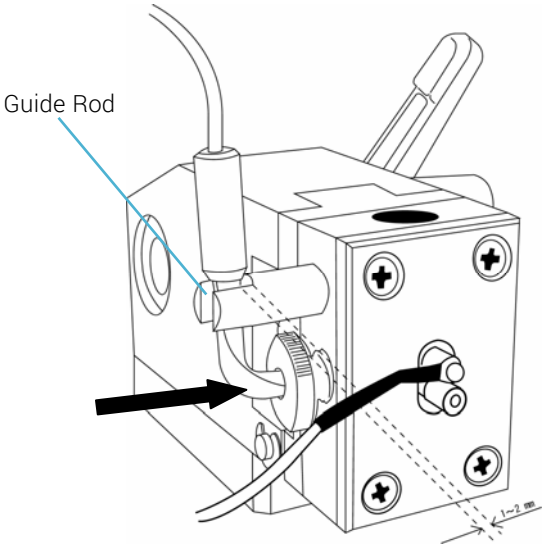

To mount the reference electrode, insert the electrode parallel with guide rod rabbet into side opening and fix it by the setscrew.

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ECD-700 can be stored with mobile phase in it if storage duration is shorter than 1 month. Avoid dehydration of the flow lines of the electrolysis cell when it is stored with mobile phase as precipitation of salts in the mobile phase will clog the flow lines.

When ECD-700 will not be used for 1 month or longer, flush flow lines with pure water and remove the reference electrode from the cell. Keep the tip of reference electrode immersed in 1 mol/L LiCl solution as continuous contact of reference electrode tip with non-salt liquid will accelerate the deterioration.

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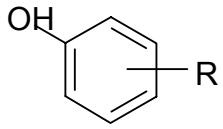
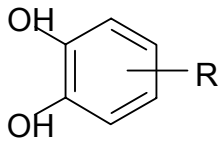
8. REPRESENTATIVE EXAMPLES OF ELECTROCHEMICALLY DETECTABLE SUBSTANCES



Phenols

Tyrosine, Tyramine, Thyroxine, Thyronine, etc.

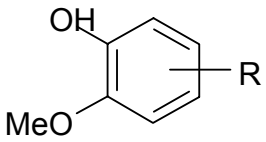
+800 mV - +900 mV (vs. Ag/AgCl)



Catechols

Epinephrine, Norepinephrine, Dopamine, L-DOPA etc.

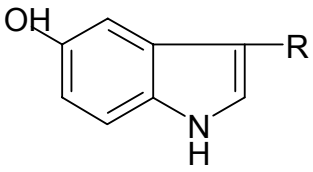
+400 mV - +700 mV (vs. Ag/AgCl)



Methoxyphenols

Homovanilic acid, Methanephrine, Normethanephrine, Vanilic acid etc.

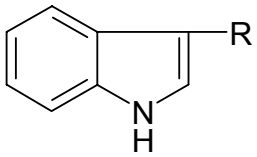
+800 mV - +900 mV (vs. Ag/AgCl)



5-Hydroxyindoles

Serotonin, 5-Hydroxyindole-3-acetic acid, 5-Hydroxytryptophan etc.

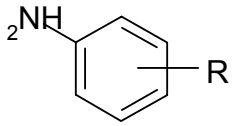
+600 mV - +700 mV (vs. Ag/AgCl)



Indole-3-derivatives

Tryptophan, Indolyl-3-acetic acid, Tryptamine, Melatonin etc.

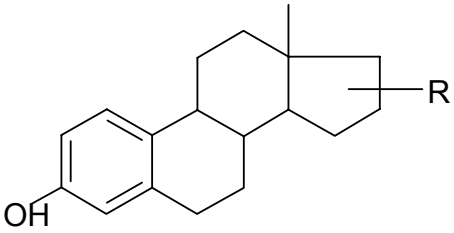
+800 mV - +900 mV (vs. Ag/AgCl)



Anilines

Chloroanilines, Bromoanilines, p-Phenylenediamine, Benzidine, Sulfonamides etc.

+900 mV - +1000 mV (vs. Ag/AgCl)



Estrogens

Estron, Estradiol, Estriol

+900 mV (vs. Ag/AgCl)

Ascorbic acid

+800 mV (vs. Ag/AgCl)

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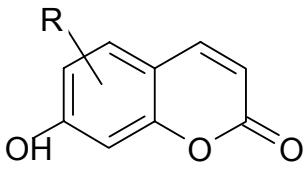
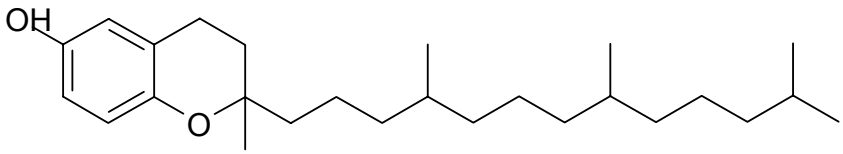


Hydroxycoumarins

Scopoletin etc.

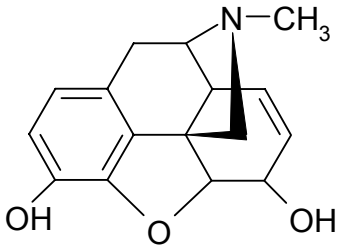
+800 mV - +900 mV (vs. Ag/AgCl)



Tocopherols

α-, β-, γ-, δ- Tocopherols

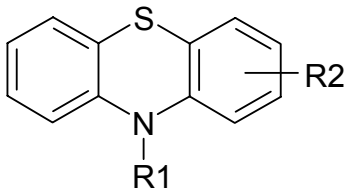
+700 mV (vs. Ag/AgCl)



Morphine

Morphine

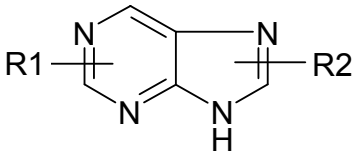
+800 mV (vs. Ag/AgCl)



Phenothiazines

Chlorpromazine, Promethazine, Perphenazine etc.

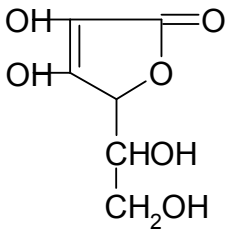
+900 mV (vs. Ag/AgCl)



Purines

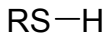
Uric acid, Xanthine, Guanine, Theophylline etc.

+800 mV - +1100 mV (vs. Ag/AgCl)



Ascorbic acid

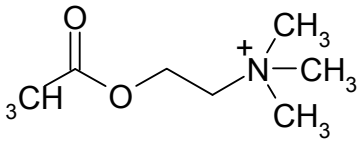
+800 mV (vs. Ag/AgCl)



Thiols

Cysteine, Glutathione, Penicillamine etc.

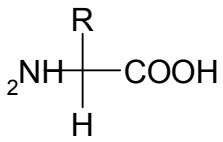
+600 mV - +800 mV (vs. Ag/AgCl)



Acetylcholine

Detectable after conversion into H2O2 by a post-column enzyme reactor.

+450 mV (vs. Ag/AgCl)



α-amino acids

Detectable after reaction with o-phtalaldehyde (OPA).

+500 mV - +700 mV (vs. Ag/AgCl)

Anions

SCN-, S2O32-, SO3-, NO2- etc.

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Symptoms	Causes	Solutions
High background current and/or unstable baseline Unstable baseline Baseline drift Decreased sensitivity	Contamination of HPLC system	Wash the system with acidic solution, see 2-4 & 5-1-1.
	Contamination of mobile phase	Use high-purity solvents and reagents, see 5-1-2.
	Unstable delivery of mobile phase by HPLC pump	Use precision HPLC pumps or set pulse dampers, see 2-4.
	Air bubbles in the flow lines	Remove air from the lines
	Leakage of the mobile phase	Check the entire system for leaks.
	Rapid change of ambient temperature	Use ATC-700 column oven or place ECD-700 in a constant temperature room.
	Residual metal ions eluted from columns and/or flow lines	Wash pumps and lines with acidic solution, see 2-4. Use low-metal-residue columns or age them well. Use inert (metal free) pumps.
	Electrostatic noise on HPLC systems or columns.	Ground ECD-700 and other HPLC equipment including data processors and columns each other, see 3-3.
	Sensitivity range setting is wrong	Reset the range.
	Staining of working electrode	Wipe the working electrode, see 6-1, or replace it with a new one.
	Deterioration of reference electrode	Replace the reference electrode with a new one, see 6-2.
	Troubles on the circuit boards	Contact your local distributor or EICOM.
Spike Noise	Air bubble in the cell	Degas mobile phase. Use on-line degassers.
	Insufficient grounding	Ground all the equipment and columns, see 3-3.
Unresolved peaks Shortened retention times Unstable retention times	Inappropriate HPLC conditions	Optimize HPLC conditions.
	Deterioration of the separation column	Wash the column by appropriate procedure or replace it with new one.
	Insufficient equilibrium of the separation column	Equilibrate the column well with mobile phase.
	HPLC pump failure	Check pumps
Zero point shift on the recorder	Electrical isolation between ECD-700 and recorders	Ground ECD-700 with recorders.

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10. ORDERING INFORMATION

Parts	Product Type	Catalog Code
Graphite Working Electrode	WE-3G	100010
Pure Graphite Working Electrode	WE-PG	100040
Glassy Carbon Working Electrode	WE-GC	100020
Platinum Working Electrode	WE-PT	100030
Gold Working Electrode	WE-AU	100050
Silver Working Electrode	WE-AG	100060
Reference Electrode	RE-500	100500
Gasket (25 µm)	GS-25	100080
Gasket (50 µm)	GS-50	100090
Gasket for Platinum Working Electrode (25 µm)	GS-25P	100085
Gasket for Platinum Working Electrode (50 µm)	GS-50P	100095
Working Electrode Setting Plate		100160
Electrolysis Cell Block (PEEK)		100180
Reference Electrode Setscrew		100200
Counter Electrode Lead Wire		100190
Daiflon Ferrule for ECD Cell Inlet (10 pcs/set)		900043
Working Electrode Polishing Compound (only for WE-PG, WE-GC, WE-PT & WE-AG)	DC-10	100170

Optional Parts

Parts	Product Type	Catalog Code
Dual Channel Graphite Working Electrode	WED-3G	
Dual Channel Glassy Carbon Working Electrode	WED-GC	
Dual Working Electrode Setting Plate	WCP-7	
Dual Working Electrode Lead Wire	WCL-7	
Single Amperometric Flow Cell (for Ch.3)	EC-300S	
Single Amperometric Flow Cell Extension Board (for Ch.3)	AXB-7	
Single Coulometric Flow Cell (for Ch.3)	PEC-510C	
Single Coulometric Flow Cell Extension Board (for Ch.3)	CXB-7	

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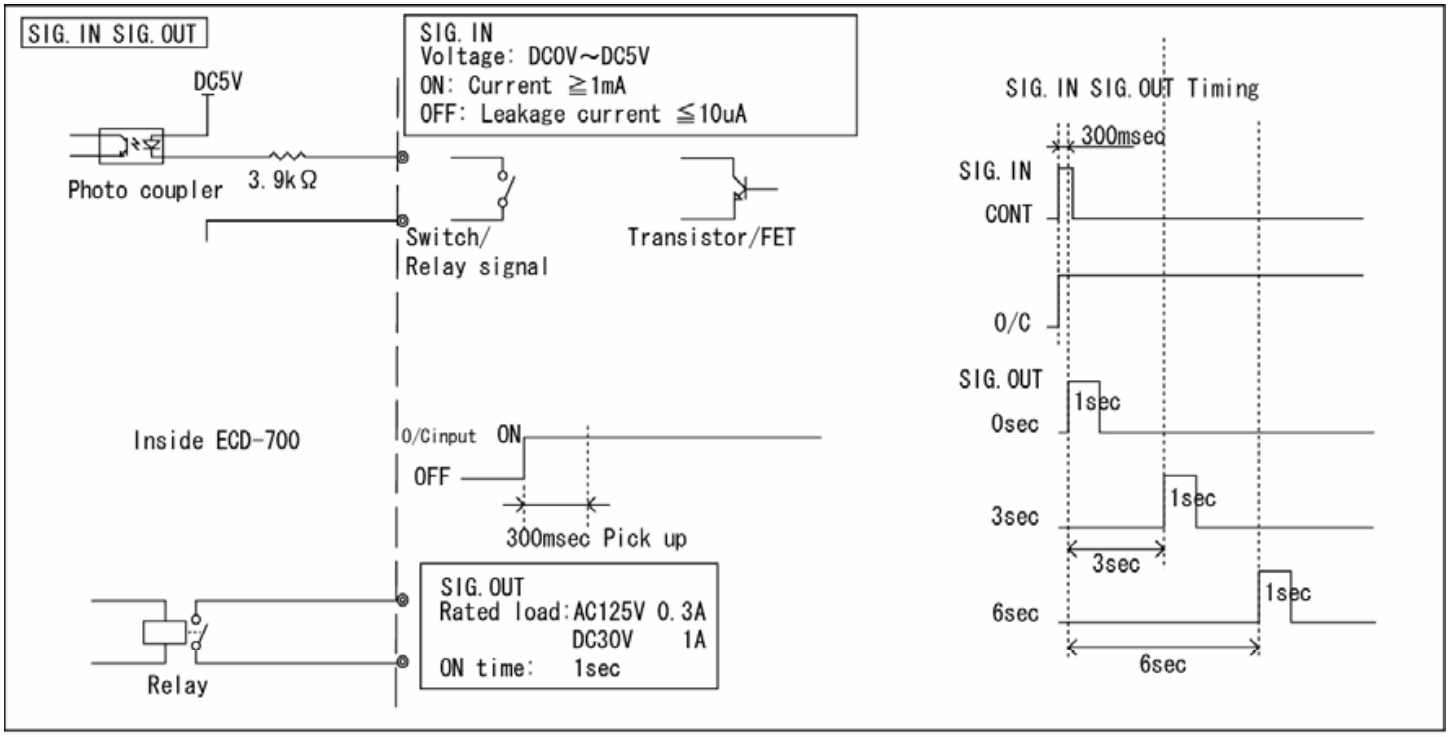
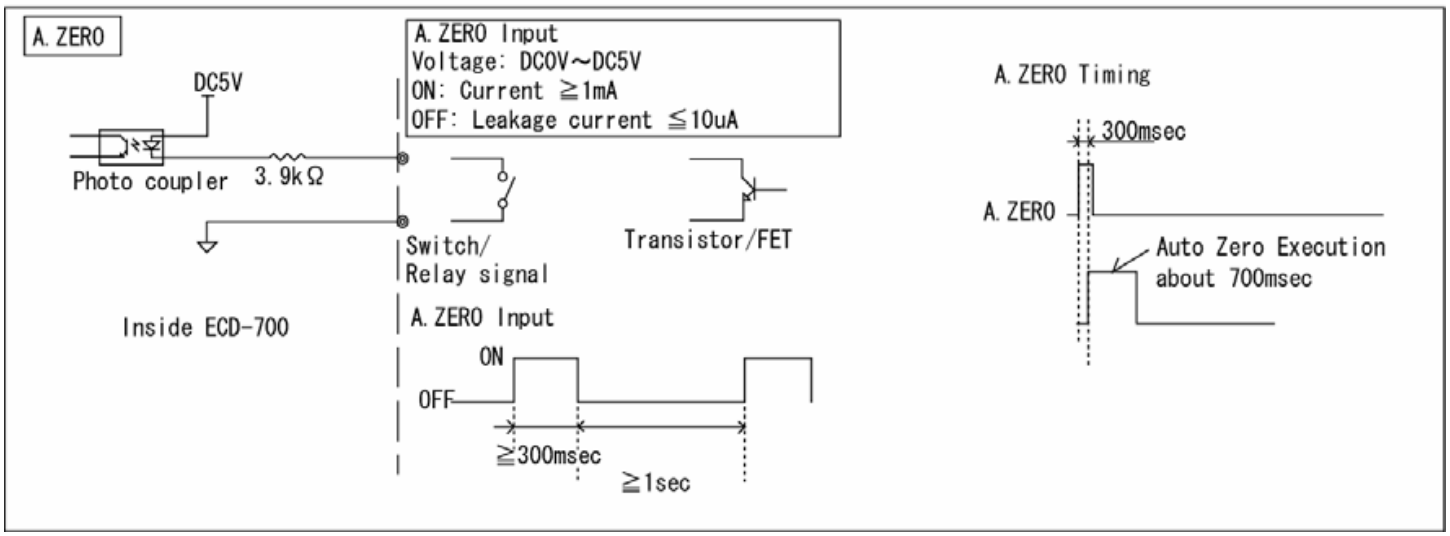
CPU I/O Control





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